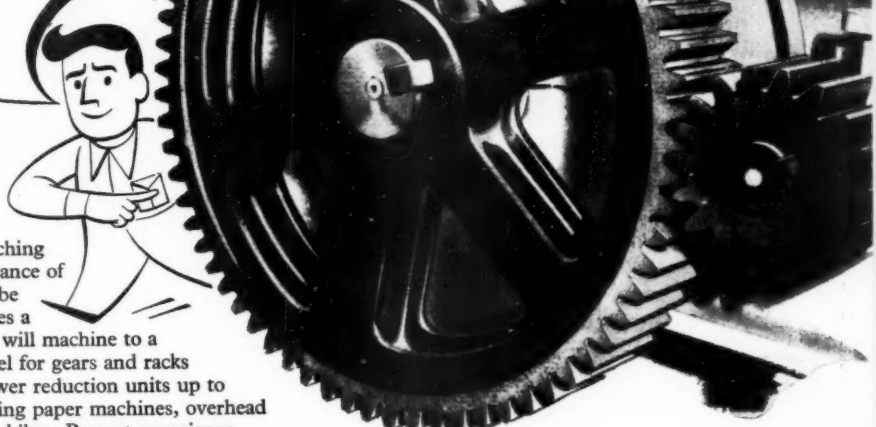
FOUNDRY TRADE JOURNAL
EST. 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
VOL. 102
No. 2103
Registered at the G.P.O. as a Newspaper
JANUARY 31, 1957
Offices: John Adam House, John Adam St., London, W.C.2
Single Copy, 9d. By Post 1/-. Annual Subscription, Home 40/-, Abroad 45/- (Prepaid)

UNIVERSITY OF MICHIGAN
FEB 19 1957
EAST ENGINEERING LIBRARY

S. G. iron cures industry's teething troubles



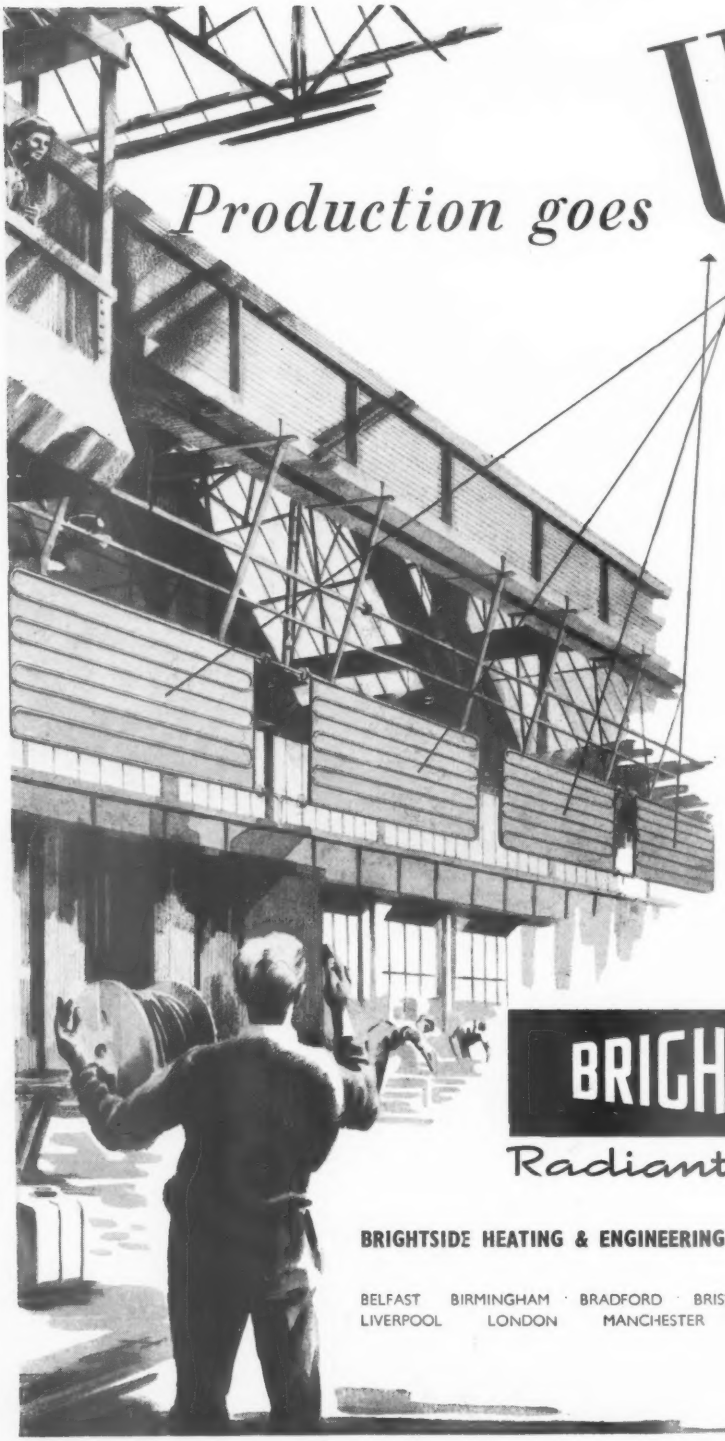
S. G. Iron has strength approaching that of steel and the wear-resistance of cast iron. Like cast iron it can be cast accurately to form, possesses a measure of self-lubrication and will machine to a good finish. It has replaced steel for gears and racks ranging from small gears in power reduction units up to gears of large diameter for driving paper machines, overhead cranes, rotary mills and cement kilns. Present experience indicates that for a given design it will frequently outlast cast steel.

S. G. Iron (Spheroidal Graphite Cast Iron) is manufactured under licence and is the subject of patents and patent applications in the name of the Mond Nickel Company Limited.

MOND NICKEL

THE MOND NICKEL COMPANY LIMITED · THAMES HOUSE · MILLBANK · LONDON · SW1

TGA 21/3P



Production goes UP

Why? Because better working conditions make for higher productivity. Brightrad Radiant Panels help to provide these better conditions.

Literature will be gladly sent on request.

BRIGHTRAD

Radiant Panels

BRIGHTSIDE HEATING & ENGINEERING CO., LTD. SHEFFIELD 1.

BELFAST · BIRMINGHAM · BRADFORD · BRISTOL · EDINBURGH · GLASGOW
LIVERPOOL · LONDON · MANCHESTER · NEWCASTLE · PORTSMOUTH

B.P.83

FOUNDRY TRADE JOURNAL

Established 1902

Vol. 102 Thursday, January 31, 1957 No. 2103

Editor:
V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN.
Advertising Manager: LENNOX HOLT, M.I.B.F.
Production Manager: R. J. LOVELL.
Publisher: H. J. DWYER.
Circulation Manager: E. T. GRIFFITHS.

District Representatives:
G. P. ELLIOTT (*Northern Area*)
T. H. SMITH (*Scotland*)

PRINCIPAL CONTENTS

Technical : PAGE

Production Factors Contributing to High-quality Grey Iron, by Dr. A. W. Schneble: To ensure highest quality production at the lowest possible cost, the utmost skill in control of production is necessary, and the Author describes methods and equipment used in an American foundry for attaining the necessary standard . . **131**

Abstracts from the Dusseldorf Congress Papers: The papers summarized in this week's issue deal mainly with ironfounding, and aspects covered include continuous casting; formation of oxide patterns; developments of internal stresses; and physical properties **137**

UK Research on Cast Iron: Conclusions and opinions on the various aspects of nodular-graphite cast iron as reported by staff of the British Cast Iron Research Association **145**

Doehler-Jarvis Die-casting Plant **147**

Features :

Leader: A Successful Scheme . . . **129**
Equipment and Supplies **143**
Book Reviews and New Catalogues . **148**
Forthcoming Events **160**

Commercial :

Pig-iron and Steel Production in November **152**
Company News and New Patents . . **155**
Raw Material Markets **156**
Current Prices of Iron, Steel and Non-ferrous Metals **158**
Contracts Open **160**

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Weekly

Single copy 9d.; by post 1s.
Annual subscription: home 40s., abroad 45s. (prepaid)

17/19 JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

'Phone: TRAfalgar 6171 (10 lines)
'Grams: Zacatecas, Rand, London

A Successful Scheme

We feel sure that the Board of Trade will be more than satisfied with the final report submitted to it by the Association of Bronze & Brass Founders, as to the use that has been made of the funds granted under the Conditional Aid Scheme. A broad view was taken of what should be done to help the non-ferrous foundry industry. Primarily, in conjunction with the British Non-Ferrous Metals Research Association, a high-grade metallurgist was engaged to carry out an investigation on shell moulding and the CO_2 Process, the novelty of which subjects was still extant. Then there was a series of lectures carefully chosen to present problems of major interest to the executives of the non-ferrous foundries—that is, the down-to-earth variety. The third activity promoted from the funds was the institution of a consulting service for founders.

Dealing with these *seriatim*, the appointment of a scientific investigator has resulted in an appreciation by the foundry owners that the research associations can be of material help in their day-to-day problems. On the other hand, the research associations have been shown the type of work—well within their scope—which is most appreciated. The bonds between the two have been materially strengthened and a good basis has been formed for future close co-operation. The fact that over a thousand foundry executives attended the lecture programme which was arranged is significant of the interest aroused. Thoughts were certainly directed into that most useful of all channels—of getting increased output more economically from existing (or but slightly augmented) plant.

In implementing the consulting service, it was found necessary to pay one or more visits to 27 foundries, the queries from which came within the terms of reference. It is interesting to learn from the report on the scheme, that by and large, the firms visited were quite small—usually having fewer than a dozen employees. It is reasonably certain that, but for the existence of this scheme, they would still be struggling—unaided—with their problems. It is lamentable that all this service has come to an end for there is still much to do. However, enough has been accomplished to indicate the major problems besetting the small brass founder, which can be solved by using the many sources of help available to him. The research associations, and the development departments of those bodies interested in the sales of nickel, copper, tin, and other metals and the suppliers of foundry materials are also well placed to give good advice. We cannot help but feel that the great expansion in UK output of the copper-base alloy castings in recent times is not unconnected with the success of the Conditional Aid Scheme.

Dinners

BIRMINGHAM BRANCH

Last Friday, premises at the Botanical Gardens, Edgbaston, were fully extended to cater for 250 members and guests of the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen for the annual dinner and dance. At the high table, the branch president, Mr. T. H. Weaver, M.I.B.E., M.I.PROD.E., had amongst his guests Mr. E. W. Hancock, M.B.E., M.I.MECH.E., president of the Institution of Production Engineers (deputy chairman, Humber, Limited); Mr. H. J. V. Williams, president of the IBF; Mr. A. R. Parkes (FOUNDRY TRADE JOURNAL) and Mr. G. Lambert, IBF secretary, all of whom were accompanied by their ladies. After the "Loyal" toast, Mr. Hancock proposed that of the "Birmingham Branch", the response being by Mr. Weaver. "The Guests" was proposed by Mr. E. Hunter (past-president of the branch) and Mr. Williams replied. The evening continued with dancing and carriages were called at 2 a.m.

BEDS AND HERTS SECTION

Also on Friday last, the Beds and Herts section of the London branch of the Institute mustered a good turnout of members and guests for their "stag-party" at the Royal Hotel, Luton. Here, Mr. A. F. Hammond, the section president, was assisted in his duties by Mr. L. A. S. Harbourne, M.C., in the rôle of toastmaster. The toast of "the Visitors" (who included Mr. M. J. Glenny, president of the London branch, and Mr. V. C. Faulkner, past-president of the Institute and the branch) was proposed by Mr. G. Smith, section vice-president, and Mr. W. T. Hobkirk, president of the Association of Bronze & Brass Founders, replied. It fell to Mr. Glenny to give the toast of the "Beds and Herts Section" and Mr. F. C. Baker responded. After a short interval, the evening was later given over to light entertainment provided by the "Mudlarks" concert party, with Mr. Greenwood at the piano.

LANCASHIRE BRANCH

Last week's IBF social activity was concluded by a brilliant function organized by the Lancashire branch through its honorary social secretary, Mr. E. H. Beech, and honorary secretary, Mr. F. W. Nield. Held at the Grand Hotel, Manchester, on Saturday, it started at 3 p.m. with afternoon tea and a whist drive, followed by a reception by the branch president and his lady (Mr. and Mrs. W. S. Spenceley) at 5.15 p.m. and afterwards dinner and dancing. At this function also, the IBF national president and secretary, respectively, Mr. H. J. V. Williams and Mr. G. Lambert (the latter acting as toastmaster), and Mr. A. R. Parkes (secretary, London branch) accompanied by their ladies were among the guests. Mr. Williams was called upon to propose the toast of the "Lancashire Branch," Mr. Spenceley responding. The principal guest was Mr. K. F. Massey, J.P., M.A., M.I.M.E. (chairman and managing director of B. & S. Massey, Limited) and he it was who responded to the toast welcoming the visitors, proposed by Mr. Beech. "The Ladies" toast was wittily proposed by Mr. R. Yeoman and the president's wife replied for the fair sex. A charming interlude was injected into the proceedings at this stage in the form of a presentation of a memento in silver to Mrs. Spenceley from the "Associates" of the branch, handed over by Mr. Spenceley, junior, who himself is one of their number. The final toast—to the secretary—was proposed by Mr. H. Booth and Mr. Nield's reply closed the formal part of the proceedings.

(*See also page* 154)

CFA Constitution

During 1954 the Council of Ironfoundry Associations requested its executive committee to study the constitution of the Council for the purpose of recommending in what ways it needed amendment. The Council thought that the document, originally drawn up under the pressure of wartime circumstances, and adopted on September 9, 1941, could well stand re-examination. After its original adoption it had been amended in various ways on four occasions to bring it into line with the needs revealed as the organization developed. A new constitution, embodying of course much that was sound in the old one, was in due time submitted to the Council. In its final form, this was unanimously adopted, by special resolution, at the Council's meeting on January 17.

In general, the constitution now puts into unambiguous language rules as to administration and procedure that were necessarily of a somewhat empirical kind when the CFA was formed. It makes the "government" of the CFA subject to one harmonious code assembling in more orderly arrangement not only what was originally laid down, but the usages which have become established as experience has been gained over nearly 16 years. The effect of the new constitution, the Council hopes and believes, will thus be not only to clarify procedure but to remove any anomalies that might be sources of possible doubt or difficulty in the future.

Possibly the outstanding criticism to which the former constitution was open was the restriction of voting when the Council is in session to one vote for each constituent association, regardless of its size or importance or the number of representatives entitled to attend. This would have operated to the disadvantage, for example, of the engineering and general ironfounders, now represented on the CFA by the National Federation of Engineering and General Ironfounders, in place of its two constituents, the National Ironfounding Employers' Federation and the Ironfounders' National Confederation. The new constitution overcomes this difficulty, and constituent associations now have a mutually agreed representation and voting power which takes account of the wide range in their relative size and importance.

The constitution has been progressivly adapted over the years to the needs of the industry as the Council has seen them. The changes introduced in the document just adopted, in accordance with the wishes of the executive and the Council expressed on various occasions during the past three years, go deeper than earlier amendments. They are also, as was necessary and, indeed, inevitable, the fruit of much longer scrutiny and consultation. The table appended shows the full-member and affiliated associations as listed in the new constitution.

Member Associations of the CFA

Full Member:

- Association of Automobile and Allied High-Duty Ironfounders;
- British Bath Manufacturers' Association Limited;
- British Ironfounders' Association;
- British Malleable Tube Fittings Association;
- Cast Iron Axlebox Association;
- Cast Iron Chair Association;
- Cast Iron Heating Boiler and Radiator Manufacturers' Association Limited;
- Cast Iron Pressure Pipe Association;
- Cast Iron Segment Association;
- Greensand Pipe Founders' Association;
- National Association of Malleable Ironfounders;
- National Federation of Engineering and General Ironfounders;
- National Ingot Mould Association;
- National and Midland Ironfounders' Association.

Affiliated:

- British Grit Association;
- British Cast Iron Research Association;
- Institute of British Foundrymen.

Production Factors Contributing to High-quality Grey Iron

*By Dr. A. W. Schneble**

The high-class jobbing shop must apply the utmost skill in control of production at all stages when making top-quality alloyed grey iron castings for forming dies to be used for automobile pressings. Sand preparation and distribution, plus melting, pouring and other critical operations are carried out under rigid quality control methods and checked by physical and chemical tests.

In America the general jobbing shop is becoming a thing of the past, as more and more foundries begin to specialize to compete with the low-cost "tied" plants, yet there still is a need for local jobbing shops to supply the small quantity requirements of area industries. Most of these jobbing operations are carried out with crude equipment and a minimum of controls. The result is iron just adequate to meet requirements without regard for minimum porosity or the best surface-finish and dimensional tolerance. Some forward-looking shops, however, are incorporating good engineering practice, improved controls and sound accounting and cost methods to produce the highest quality irons at the lowest possible cost in small grey iron runs and large castings of alloyed, high-strength iron. The Advance Foundry Company in Dayton, Ohio, USA, a plan view of which is shown in Fig. 1, is an example of this trend. This high-class jobbing shop not only produces short runs of standard iron including solid and cored moulds, but a considerable yearly tonnage of high-strength forming dies of Strenes metal† for the automobile industry. Overall iron production in the foundry, averaging about 900 tons per month, includes: (1) four basic types of iron produced regularly in the cupola, (2) twelve different types produced intermittently, (3) six standard types produced by alloy additions.

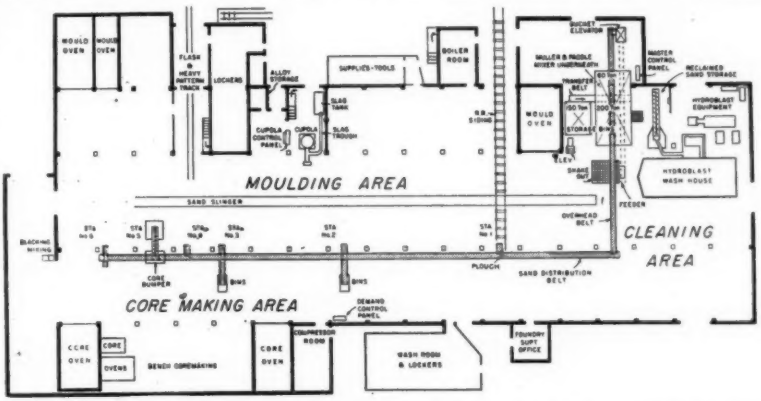


FIG. 1.—*Plan view of the shops of Advance Foundry Company in Ohio, showing all departments in addition to details of the automatic sand-preparation and -handling system.*

Sand Preparation and Handling

The importance of sand control in foundries is recognized as a fundamental factor in quality production. At this foundry, quality control methods are used constantly to check raw material, mix and return grades. To maintain the required uniform properties in six different sands, plus heap sand, tests are made every day for the percentage of moisture, green-compression, green-permeability, dry-permeability, deformation, toughness, hardness and dry tensile strength.

The sand preparation and handling system is automatic and consists of overhead and floor-level hoppers, a muller and paddle mixer, belt and bucket elevators integrated to operate through two control panels—a master control panel located in the sand-preparation area and a demand panel in the core room. The storage hoppers hold 410 tons‡ of sand ready for mixing. The muller and paddle mixer are located directly underneath. Return sand from shakeout and Hydroblast cleaning units is stored in bins and all sand is fed to the mixer, as required, by gravity and conveyors. Automatic dust collectors are located at strategic points in this system.

Mixing is controlled by the operator through the master control panel (see Fig. 2). When sand

* The Author is vice-president (operations) Advance Foundry Company, Dayton, Ohio.

† A proprietary cast iron, see also caption to Fig. 6.—Editor.

‡ Winter conditions in America demand the carrying of larger stocks of sand than would be the case in this country.—Editor.

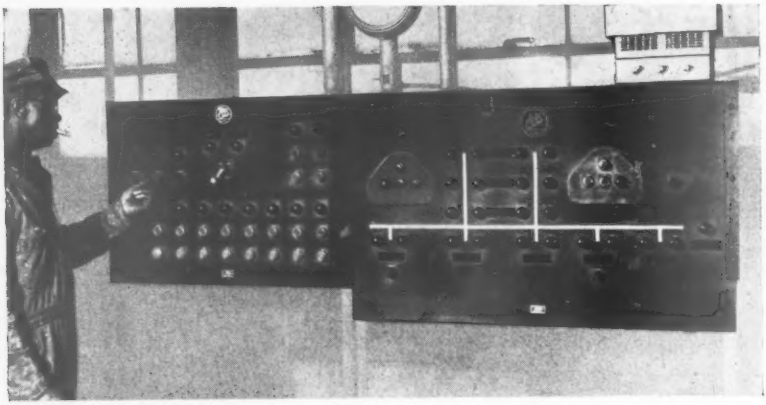


FIG. 2.—*Central control panel for the sand system. The operator controls mixing and delivery of the prepared sand from this panel.*

is required at some point on the floor, the foreman pushes a button on the demand panel that corresponds to the nearest of the system's six discharge points (see Fig. 1). The corresponding light goes on at the main panel, signalling to the operator that sand is required. If more information is required he can immediately talk to the foreman by a telephone connecting the two panels. The plant operator then makes the necessary sand mix and

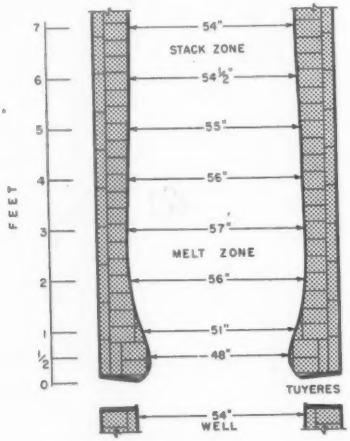


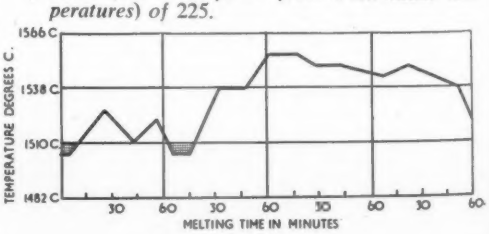
FIG. 3.—*Cross-section of cupola showing contour lining dimensions that are rigidly maintained during daily repair with refractory material in a semi-fluid form. The standard volume of the melting zone is 88.9 cub. ft.*

starts automatic delivery by pushing a button. A "memory" circuit in the master panel permits delivery in proper order only, while safeguards prevent delivery to the wrong discharge point. The properly proportioned and blended mix travels from the muller to a bucket elevator where it is lifted to an overhead belt conveyor 34-ft. above floor-level and extending across the width of the building. At the end of this conveyor, the sand drops on to another belt conveyor running the length of the building on the north side.

To discharge the mix at any of the six discharge stations, a "plough" drops automatically on to the belt and diverts the sand at right angles into a gravity chute. The belt system continues to run for a few minutes after discharge to clear the system before the next order can be filled at another discharge point. The moulding floor, core room and Sandslinger are served in this manner. A special mix can be delivered in a matter of minutes; system sand is available for immediate use; the plant can handle 50 tons per hour. By automatically preparing and delivering sand with this system, closer control of the mix is attained and moulding time cut to an absolute minimum, while tedious extra handling is eliminated.

The production of cores and moulds is also closely controlled. After the mould has been rammed with green-sand and completed, large ones are dried, using a portable direct gas-fired heater with a blower, and the smaller moulds are placed in a special oven. The cores are also given a very careful baking in a convection-heated oven equipped with a gas-fired air heater and a recirculating fan. Very close control is maintained up to 285 deg. C. by automatic instruments. Another interesting practice used in the preparation of the graphite

FIG. 4.—*Daily graph of pouring temperatures. The degree-minutes product for the curve under 2,750 deg. F. (1,510 deg. C.) is used as a basis for controlling production quality. The daily record shown averaged 2,789 deg. F. (1,532 deg. C.) temperature with a degree-minutes value (when computed from Fahrenheit temperatures) of 225.*



mould-coating material, this graphite, clay and water mixture is kept under constant agitation for maximum uniformity. Its density is also checked daily.

Melting Practice

Since the majority of grey iron produced in this country (America) is melted in cupolas, there are many different opinions as to what constitutes the best practice. Due to the vital importance of this stage in iron production, the Advance Foundry has for years exercised close control to ensure maximum uniformity and precise accuracy. To do this, accurate instruments are used and a rigidly controlled operating procedure and records system is carried out for every melt.

Contour Lining

Contour lining has been standard procedure since 1945 (see Fig. 3). Every morning after the waste material has been dumped and cleared away, the cupola inside diameter is measured (east-west and north-south) at specified levels from the well to the stack. These data are used in calculating the volume of the melt zone and the volume of the stack zone. It is tabulated and recorded every day. The required contour is then built-up, using Gunite-type equipment for blowing semi-fluid refractory material against the wall to the depth required. The resulting contour ranges from 57-in.

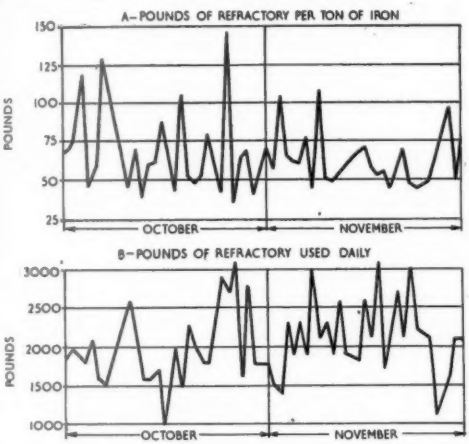


FIG. 5.—*Refractory patching consumed per ton of iron produced and record of refractory used daily.*

dia. at widest point in melt zone to 48-in. dia. at the well.

Conventional charging methods are used with all materials accurately weighed and mechanically handled. To start a melt, the first charge of coke is placed on wood supports to a definite height and lit by three gas torches inserted through the tuyere openings. These are turned off after 15 min. and the air blower is then operated for about 15 min.

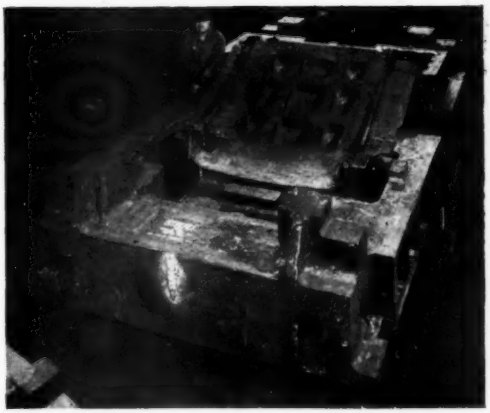


FIG. 6.—*Casting for a body-forming roof die (lower shoe) weighing 28 tons. This was cast in Strenes* metal by the Advance Foundry. This high-alloy grey iron is claimed to be excellent for sheet-metal-forming dies of this type as it possesses excellent lubricating qualities, will not distort and will not cause the metal to tear or seize. In making this casting, very careful control of pouring temperature was exercised and the feeders were very carefully designed to accommodate or allow for the high shrinkage rate of this type of material.*

* Strenes metal has the following characteristics: tensile strength, 22 tons per sq. in.; breaking load in transverse of 1.2-in. bar at 18-in. centres, 3,000 to 3,200 lb., with deflection —0.25-0.30 in.; Brinell hardness of test bar, 220 to 230; impact strength (Charpy test), 60 to 70 ft./lb., and compressive strength, 78 to 90 tons per sq. in.

After two-hours soaking time, the subsequent drop in coke height is measured and make-up coke added to the required height. Metal (2,000-lb. charges), flux and then coke are then added to complete the initial melting burden. By using this method, a more uniform melt results; the bed coke is white hot before the metal charge melts and droplets start to form.

Instrumentation and Records

Instrumentation on the cupola provides a maximum of melting control to assure accuracy and uniformity. An air-meter controls the amount of air passing through the tuyeres to give the required volume at standard conditions. These readings are continuously recorded on a chart. Back pressure is also recorded and indicated. Dry- and wet-bulb temperatures are also recorded to calculate amount of carbon pick-up due to moisture in the blast. It is planned later to employ an automatic humidity-control system in which moisture is added to the air blast as required to achieve specific humidity percentages. Since air moisture always varies between seasons and has to be accounted for in making up each charge during conventional operations, preliminary tests indicate that by instrumenting this procedure, humidity control will be highly accurate yet not entail the use of costly drying equipment.

FIG. 7.—*Bed for a grinder machine-tool. It weighs* 18 *tons and measures approximately* 40 *by* 6 *by* 3½ *ft. This casting had to withstand considerable shock in use and grey iron was used because of its excellent damping characteristics combined with high strength and rigidity. A good wearing surface on the slideways was another requirement. Its tensile strength is* 18 *tons per sq. in.; its hardness* 180-200 *BHN.*

The melting department keeps complete records of each day's production. These reports include: *A cupola report* that logs the charge of materials and iron produced; a *production record* that details the type and amount of each alloy poured and where used; an *alloy record* showing distribution of alloy additions; a *heat log* showing the condition of the cupola and charges throughout the melt; and *heat data* detailing pertinent information from the other reports, plus a material inventory and melting-time record.

The preparation of these reports represents standard practice and is the responsibility of the melting foreman. He is also responsible for pouring sample bars from each ladle for analysis.

Statistical Control

The considerable amount of data gathered each day from every shift are correlated in the control department and entered on annual tables and graphs. These collectively constitute a permanent record of the foundry operations. They not only show the condition of production but also indicate pricing, estimating and overall capacity trends. Statistical control-methods are applied, in basic principle, to provide permanent records that are easy to determine and simple to apply even under a broad range of conditions. It has been found that recording metal composition at the ladle on the basis of every four charges provides a common denominator that makes this information easier to plot and also adaptable to most required production evaluations.

Permanent records are kept as follow:

(1) A curve is plotted for the average volume of the cupola, indicating the volume of the melting zone and volume of the stack zone. (2) Average of metal temperatures at the pouring spout. (3) Product of degree/minutes under 1510 deg. C. for the curve of metal pouring temperature each day (see Fig. 4). (4) Average melting rate per hour. (5) Amount of refractory material used per day in terms of tons of metal poured (see Fig. 5). (6) Average metal temperature for each truck-load of coke. (7) Analyses of constituents of every ladle plotted and projected for every 4 tons of metal poured. Samples are taken only at the pouring point. (8) Screen analyses of the six different sand mixes plus reclaimed material and raw stock are plotted for each week. (9) Physical properties of the six basic sand blends, plotted each week. The continual maintenance of this record system has paid off many times over by permitting management and production-control staff to keep their "thumbs on the pulse."

Conclusion

The foundry methods and equipment have been selected and perfected to provide the ultimate in control under job-lot production requirements. The human element has been minimized, wherever it could cause control errors, and quality methods and accounting systems imposed for the best overall control. Only by maintaining this control from raw material to finished casting, can the highest quality production at the lowest possible cost be achieved.

GEO. W. KING, LIMITED—Mr. R. G. Galpin has resigned from the board.

CHARLES ROBERTS & COMPANY, LIMITED—Mr. Stewart Kilpatrick has been appointed a director.

WILD-BARFIELD ELECTRIC FURNACES, LIMITED—Mr. John Edward Oram has been appointed managing director.

FURNESS SHIPBUILDING COMPANY, LIMITED—Mr. W. T. Butterwick and Mr. J. H. Cross, executive directors, will become joint managing directors from February 1 in succession to Mr. Robert Boardman, managing director, who is retiring. Mr. A. A. McNaughton, director and secretary, has been appointed commercial director and will continue as secretary.

Electric Furnace and Heating Equipment

The British Thomson Houston Company, Limited, in their annual review, refer to electrical equipment for the first 400-kw. high-frequency induction melting plant which was installed at Wellworthy Piston Rings' Lymington works five years ago. This year an increase in available power to about 1,600 kw. is required, and the company is supplying a 1,250-kw. motor-generator set, comprising a synchronous motor driving two 625-kw., 1-kc. alternators connected in series. Excitation of the alternators is provided by a separate motor-generator set which, in turn, is excited by the electronic regulator automatically controlling the voltage of the high-frequency busbars. Pump units are installed for the high-pressure lubrication required when starting the set. The company is also supplying the associated motor starting switchgear, comprising a Class QA solenoid-operated stator switch, reactor-shorting and field-control cubicles, and oil-immersed reactors.

Automatic electrode control equipment has been specified for an 80-ton Birlec arc furnace to be supplied to Samuel Fox & Company, Limited. This will be the largest capacity furnace of its kind in the United Kingdom, and is a development from the successful 60-ton furnace installed last year. The year has shown a marked increase in the number of orders for BTH automatic electrode control for arc melting furnaces. Amongst others, two of these equipments have been supplied for 60-ton electric melting furnaces at Round Oak Iron and Steel Works, and three for 40-ton furnaces at Brymbo Steel Works.

An order has been received from Beans Industries Limited for 1,500-kw., 1-kc. substation equipment for supplying power to a Birlec induction heating plant. This installation will comprise three 500-kw., 1-kc. generating sets operating in parallel, and excited by two motor-generator exciter sets (one as a standby) with two Thyratron voltage regulators (one of these also operating as a standby) for automatically controlling the voltage of paralleled high-frequency busbars. For each set three-breaker, 250-Mva, 11-kv. Korndorfer starting is being supplied.

Birmingham's Outlook "Not Happy"

The general trade situation among Birmingham manufacturers is "not at all happy" says the current issue of the *Birmingham Chamber of Commerce Journal*. It forecasts increasing unemployment and short-time working and says the more difficult conditions of trading generally, will make the reabsorption of displaced workers increasingly difficult. The higher cost of steel is bound to cause the prices of finished goods to rise it is stated and this will be to the disadvantage of firms competing in the export market. In addition, difficulty is being experienced in obtaining even moderate supplies of some raw materials, especially nickel and special types of steel.

Firms engaged in general heavy engineering appear to have enough work in hand for the next nine months but this will be in fulfilment of orders placed some time ago. There is some doubt as to the extent to which new orders will be booked. On the credit side are the widening prospects offered to the heavy engineering industry by atomic energy developments.

HIGHER MANUFACTURING COSTS have, states British Titan Products, Limited, forced it to raise the prices of its titanium pigments on February 1. Surcharges for small deliveries will also be raised on the same date.

British Standards Institution

Fifth Revision of Tensile Test

For 52 years British Standard B.S 18:1956 has been in constant use by industry. Introduced for the purpose of eliminating unnecessary variations in tensile testing requirements, it has since been revised four times to keep its requirements abreast of advancing technology. The British Standards Institution now announce the publication of a fifth revision, and in preparing it, the aim has been to describe and define all procedures relating to tensile testing which are common practice throughout industry.

Two New Test-Pieces

A new feature of the standard is the inclusion of two proportional test pieces, which may be of circular, square, rectangular or hexagonal cross-section, with gauge lengths equal to 4 and 5.65 times the square root of the cross-sectional area of the parallel portion. They are two of the test-pieces recommended by the ISO technical committee on steel. As in the previous edition, the dimensions of various other test-pieces are specified. Non-proportional test-pieces, used chiefly for sheet, plate, strip, flat bars, sections and tubes, have been retained.

The requirements specified for test-pieces for tubes, relate to the testing of the tube whole, or when strips are cut longitudinally or circumferentially from it, or when the test-piece is turned from the wall of a thick tube; test-pieces for wire are also dealt with.

A section dealing with standard methods of procedure for tensile testing includes a revised clause on proof stress and new clauses on permanent set stress and proving tests; other clauses deal with yield, tensile strength and percentage elongation.

Terms Defined

Terms used in the tensile testing of metals are defined; one of them is "tensile strength" which has been adopted in place of "ultimate tensile stress." Detailed description or definition of procedure which is related to specific materials has been avoided, but the foreword lists—as a guide to committees engaged in the drafting or revising of standards for materials—points which may need to be separately specified for each material. An appendix gives a comparison between the symbols used in the standard and those adopted by ISO. There are a number of graphs and drawings which illustrate the clauses.

Valve Specification

A new British standard (B.S. 2767:1956) specifies requirements for various types of screw-operated gate or angle valves, and for straight and elbow unions, in a range of sizes generally used in conjunction with low-pressure hot water radiators. They are for use at a non-shock working pressure not greater than 60 lb. per sq. in. and at a temperature not in excess of 90 deg. C. The standard also specifies the dimensions and design of valves and components, and details of tests are given for application either at 150 lb. per sq. in. hydraulic pressure or 70 lb. per sq. in. air pressure under water. Copies of these standards may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1. Price 4s. and 3s. 6d. respectively.

METALASTIK, LIMITED, manufacturers of anti-vibration mountings, etc., of Leicester, has concluded an exclusive manufacturing and sales agreement with Carl Freudenburg, K.G., Weinheim, Germany. An announcement concerning Metalastik activities in the US is expected shortly.

Denationalization of Steel

Three-quarters of Industry Returned

Nearly three-quarters of the steel industry had been denationalized by the end of September last. The third annual report of the Iron and Steel Holding and Realization Agency shows that by September 30, 1956, all but 28 of the 71 undertakings vested in ISHRA on the denationalization date—July 13, 1953—had been returned to private ownership.

In terms of employment, steel production and sales of products, the companies disposed of represent nearly three-quarters of the agency's inheritance. After three years the gross realization proceeds from disposal operations amounted to £188,000,000, of which £78,000,000 was realized in the first year, £74,100,000 in the second, and £35,900,000 in the third.

The proceeds include £176,500,000 from the sale of securities and £11,500,000 from companies as a result of capital reorganizations or redemptions before disposal or from liquidation. The agency retained £99,900,000 for investment and other purposes (including bank loan repayments of £30,300,000). The net amount paid to the Treasury on capital account was £88,100,000, comprising £20,900,000 in Government securities and £67,200,000 in cash.

Development Schemes

Within these totals, gross proceeds of £78,100,000 came from the 27 companies whose entire share capital was sold and from the liquidation of one company, resulting in a surplus of £9,900,000 over book values.

A similar comparison cannot be made in the cases of the other 10 companies for which the equity only was sold. Prior charges of these companies held by the agency had a book value of £64,000,000. The largest are £15,300,000 in the United Steel Companies, Limited, £12,100,000 in Stewarts and Lloyds, Limited, £10,700,000 in John Summers & Sons, Limited, and £10,300,000 in Dorman Long & Company, Limited.

Development schemes approved during the year were estimated to cost about £60,000,000, the more important being those of Bairds & Scottish Steel, Limited, Richard Thomas & Baldwins, Limited, the Steel Company of Wales, Limited, and William Beardmore & Company, Limited. The largest of the 28 companies still with ISHRA at the date of the report are the Steel Company of Wales, with a book value of £101,300,000 and RTB, with a book value of £22,700,000. Since then there have been sales of five companies and interests in two companies, the most notable being that of William Beardmore to Thos. Firth & John Brown, Limited.

M-V Generators for Willington

Two generators, which will be among the largest capacity machines yet built in this country, have been ordered by the Central Electricity Authority from the Metropolitan-Vickers Electrical Company, Limited. The order, which is worth more than £3,000,000, is for two 200-mw steam turbine-generator sets and associated equipment for Willington "B" power station, near Derby. Commissioning dates are planned for 1961.

The new sets will be 20 ft. shorter than the 105-mw set at Battersea "A" power station, although the output from each will be 90 per cent. greater. They will have water-cooled stator windings similar to the Metropolitan-Vickers 30-mw generator installed for the CEA recently at the Bold power station. This was the first large generator in the world to have this type of cooling.

SCOW Developments

Embargo Reduces Profits and Wages

Maintenance craftsmen's embargo in the steel industry led to the reduction of nearly £3,000,000 in the profit for the year of the Steel Company of Wales, Limited. Workpeople lost over £500,000 in wages. But for the embargo, states Mr. Harald Peake (chairman), in the annual report, output of steel ingots which dropped from 1,748,000 tons to 1,729,000 tons, would have exceeded 1,900,000 tons. Output of pig-iron increased from 943,000 tons to 1,018,000 tons during the year.

When excellent progress had been made with development work, it is particularly disappointing to record a reduction in trading profit (before depreciation) from £18,313,299 to £14,228,057. The fall in profit would have been greater but for increased iron, steel, and tinplate prices.

Outstanding events of the year were the starting up of 90 additional coke ovens and of the fourth blast furnace, believed to be the largest in Europe. The vast new tinplate works at Velindre, near Swansea, on which about £21,000,000 was being spent, started on production on a small scale last July.

At the end of the year £42,400,000 has been spent out of the total estimated cost of £54,000,000 on the company's second development scheme. The larger units to be completed under the plan should be in production this year, but a considerable amount of work has still to be done at Velindre before output reaches full capacity.

The third development plan provides for 80 additional coke ovens and a fifth blast furnace together with three Bessemer converters at Margam. They are designed to increase annual steel ingot production from 2,400,000 tons to 3,000,000 tons.

The economic consequences of the blocking of the Suez Canal has led to a reduction in the demand for steel sheets, but the demand for plate and tinplate continues to be good. Mr. Peake foresees a further reduction in oil supplies and the necessity to use larger quantities of pitch and creosote mixture.

The prospects of increased exports are excellent and during the past year steel sheets, plates, or tinplates have been exported to 16 countries in the Commonwealth and to 26 foreign countries. They account for 21 per cent. of the company's turnover last year.

Aluminium Castings Company

Preferred ordinary and ordinary shares are to be consolidated into one class by the Aluminium Castings Company, Limited, which plans to change its name to Solar Industries.

It is proposed that the issued ordinary capital be increased from £25,000 to £150,000 by the capitalization of reserves and to convert the present preferred ordinary capital of £150,000 into ordinary. Immediately after consolidation it is intended to issue a further £100,000 ordinary to ordinary holders in the proportion of one new for every three held after consolidation. CIC consent has been obtained to capitalization of £225,000.

Reduced demand from the motor industry over the last six months has led the directors to consider that the current year's profit will be substantially below the estimate of £250,000 before tax made when the debentures were issued last July. Nevertheless, the diversification of the group's interests in the UK and continued progress of the Canadian subsidiary should assist in maintaining a reasonable overall result.

Abstracts from the Düsseldorf Congress Papers*

At the International Foundry Congress held in Düsseldorf last Autumn, 26 papers were presented. They covered widely diverse subjects, ranging from the continuous casting of iron to the future problems of research in foundry techniques and even, manpower. For the convenience of the readers, synopses of nearly all these papers are given in what follows, grouped under main headings, viz.: Ironfounding; moulding methods; sands and binders, "castability" and miscellaneous. In conclusion, founders are brought very much "down to earth" by the final contribution (by Prof. Ove Hoff) in which the limitations of present-day knowledge of foundry practice are discussed and pointers are made to desirable future trends for research activity.

IRONFOUNDING

Seven papers were presented on the subject of ironfounding. They were as follow:—"Continuous Casting of Iron," by A. Wittmoser; "Influence of Gas Scavenging on the Graphitization of Cast Iron," by G. Blanc and N. Volianik (French Exchange Paper); "Effect of Gas Scavenging on the Magnesium Consumption in the Production of Spheroidal-Graphite Cast Iron," by W. Patterson; "Oxide Patterns Appearing on the Surface of Molten Cast Iron," by O. Madono (Japan); "Development of Internal Stresses Leading to the Cracking of Grey-iron Castings," by H. G. Angus and W. G. Tonks (UK) and "Influence of Silicon and Phosphorus on the Annealing Brittleness of Malleable Cast Iron," by P. Bastien, P. Azou and Miss Winter (France).

"Continuous Casting of Iron"

By A. Wittmoser

The fundamental significance of gravity-die-casting methods for the manufacture of iron castings is demonstrated, with special regard to the ever-increasing demand. In contrast with the developments for other kinds of cast iron, centrifugal casting alone has acquired significance for the casting of cast irons. In spite of a careful survey of the literature, none but scanty data could be found on the use of the continuous-casting process for the shaping of cast iron, which shows that this process is not yet established on an industrial scale for cast iron.

For the last five years, at the steelworks at Gelsenkirchen, a research group headed by the technical president of the works, Dr. Ing. A. Niedenthal, has carried out methodical series of trials on the continuous casting of cast iron. Pressure pipes for water and gas, with and without flanges, can be cast in diameters of 15¾ to 39⅜ in. and lengths up to 33 ft. Moreover, it was shown in a few other instances that the continuous-casting process can also be used on an industrial scale for the manufacture of cast-iron parts, with technical and economic success.

Gas Scavenging

Two papers were presented on the question of gas scavenging namely, "Influence of Gas Scavenging on the Graphitization of Cast Iron," by G. Blanc and N. Volianik and "Effect of Gas Scavenging on the Magnesium Consumption in the Production of Spheroidal-graphite Cast Iron," by W. Patterson. In the former, the Authors observe that under certain conditions—which may be very easily kept constant in the laboratory as well as in the works—the tendency of cast iron to solidify with a grey structure is increased to quite a considerable extent by passing gas through a bath, or, in other words, to solidify in the stable system with the precipitation of graphite rather than to solidify with a white structure in the meta-stable system, where cementite appears.

Formerly, passing gas through the bath has been studied with a view to degasification, to give an increase of the tendency to white solidification, in combination with additions of metallic elements, to accelerate the action of a slag, or, finally, as a carrier to introduce solid additions which have been prepared beforehand. The Authors study the simple passage of gas on alloyed and plain cast-iron without introducing other ingredients into the bath. The gas, which is passed through quite vigorously, is taken from steel cylinders or from a pipeline and carried to the very bottom of the iron melt by means of one or more graphite tubes having an i.d. of about ½ in.

Results

Chill samples, cast against a cast-iron mould, indicate a quite considerable diminution of the white marginal zone at the face in contact with the mould. This phenomenon occurs whichever of the gases are used; but the Authors point out that with air or oxygen, the passage of gas must not be prolonged or carried out at too high a temperature, as there is danger of a considerable decrease in the silicon content. When using an inert gas, there will always be a diminution of the tendency to the formation of white iron without the risk of a change in the composition which is, of course, the cause of white-iron structures.

* A number of other papers will be published in the JOURNAL in their entirety and all (in German) are available singly on loan to UK readers on application to the Editor.

Abstracts from the Düsseldorf Congress Papers

With grey cast-iron, the paper states that this treatment improves machinability and diminishes the danger of the occurrence of white zones in thin-walled castings. Also, in its application to a cast iron of low-carbon and low-silicon content—which without this treatment would be white or mottled—the passage of gas results in the production of sound grey cast-iron which is easy to machine and gives a tensile strength of 22 to 27 tons per sq. in. This method of treatment, the Authors say, is not difficult to carry out and has been used already on an industrial scale in ladles with a capacity of several tons. Apart from the diminution of the tendency to white iron, it is observed that the metal was free from inclusions and had a considerable improved "castability." Finally, when the graphitizing effect of the passage of gas has been carried through under appropriate conditions, it can be observed to persist after a holding time of the liquid iron of more than 1 hour, whereas the effect of inoculation with ferro-alloys, *e.g.*, with ferro-silicon, would last but a few minutes.

Author's Second Paper

In the second paper on this subject, the Author points out that purified nitrogen can eliminate oxygen and precipitate sulphides from cast-iron melts. As in the production of s.-g. iron, part of the magnesium is necessary for fixing sulphur and oxygen, a reduction of the magnesium consumption can be expected by prior bubbling of nitrogen through the melt. The Author continues by saying that experiments carried out at the Foundry Institute, Aachen, prove that the magnesium can be considerably reduced by prior nitrogen scavenging. Melts which contain interfering elements take easier to magnesium treatment after nitrogen scavenging. It is found possible to scavenge a melt of Norwegian "Vantit" pig-iron in a graphite-electrode furnace with nitrogen and to obtain—after subsequent treatment with pure magnesium—spheroidal-graphite cast iron. The tensile strength as-cast is 37.5 tons per sq. in. along with 5 per cent. elongation. The scavenging effect is more intensive if gas bubbles of small-pearl size are made to rise through the melt.

The formation of certain degenerate forms of spheroidal graphite ("crab" graphite) has been interpreted in the following manner: It is postulated that a short time after the beginning of the growth of the nodules in the melt, crystallization of ledeburite occurs and that its cementite plates may make contact with the growing nodules. Following this, disintegration into graphite occurs, supported by the presence of titanium. The nodules are also studded with lamellae which are sometimes branched. Cross-sections through such branches assume the shape of crabs in the paper, in two-dimensional micrographs. Inclusions of titanium, vanadium and carbide were found in the nodules and they seem to have influenced the crystallization of the spheroidal graphite.

"Oxide Patterns Appearing on the Surface of Molten Cast Iron"

By O. Madono

The Author begins by saying that the various pattern shapes of oxide films becoming visible on the cooling surface of molten cast-iron can be explained by reference to the FeO/SiO_2 phase diagram. There are four typical forms of this pattern, *i.e.* hexagonal structure, needle shape, bamboo-stalk type and ice-floe structure. The hexagonal structure is attributable to the co-existence of tridimite crystals and molten oxides; the needle as well as the bamboo-stalk type are ascribed to the formation of Fayalite in the presence of molten oxides. The Author states that a study of these characteristic patterns makes it possible to assess the chemical composition of the molten iron or establish the nature of gases present in large quantities in the melt.

"Development of Internal Stresses Leading to the Cracking of Grey-iron Castings"

By H. G. Angus and W. G. Tonks

This paper examines the previous information already reported by the British Cast Iron Research Association and shows that cracking stresses are mainly caused by temperature differences, and do not commence to develop until the hottest member has cooled to a temperature of the order of 700 to 750 deg. C. The stresses which develop above this temperature are opposite in direction to the final stresses existing in the cold casting. The plastic deformation of the hotter portions of the casting, which occurs above 700 deg. C., serves to ensure that when all portions of the casting are cool enough to support stress, a substantially stress-free system exists in which different portions of the casting are at different temperatures. From this point final stresses develop at a result of differential contraction.

The paper summarizes the effect of metal composition, micro-structure, methods of running, time and method of knock-out—and other variables which may occur in the course of manufacture—upon the development of casting stresses, and shows a range of examples from relatively-thin-section boilers to heavy machinery castings which have failed, outlining the causes of failure.

"Influence of Silicon and Phosphorus on the Annealing Brittleness of Malleable Cast-Iron"

By P. Bastien, P. Azou and Miss Winter

Temper embrittlement of malleable iron is investigated by testing mechanical strength, both at room temperature and at elevated temperature, by dilatometric tests and by X-rays. Special consideration is given to the influence of silicon and phosphorus, and the effect of these two elements on the position of the transition temperatures is clearly shown. A theoretical explanation of the embrittlement process is proposed, taking into consideration the possibility of iron carbide formation at 475 deg. C.

"Construction and Operation of the Basic Cupola in Italy"

By D. Masperi (Italy)

The paper deals, from the metallurgical point of view, with the advisability of using the basic cupola melting process for cast-iron. Problems connected with the basic process are discussed, *e.g.* the use of mixed steel and iron charges utilizing higher proportions of steel than normal, the use of low-grade charge material, production of s-g cast-iron, and also high-carbon cast-iron for steelworks making ingots.

The technical advantages of the basic process compared with the acid process for melting cast-iron are discussed at length mainly as regards desulphurization, dephosphorization and carburizing. Basic refractory materials and their properties, when used for cupola linings, are reviewed and an Italian process for the production of stabilized dolomite and sintered tar/dolomite is mentioned. These materials can be used as shaped bricks, blocks or as ramming material.

Experiments in Italy with the basic cupola, particularly in the foundry of the Ansaldo works, extending from May, 1952, to the recent commencement of full operation, have given valuable experience. A comprehensive description is given of the charging of a 32-in. dia. cupola, also of the complete furnace plant.

Several charge compositions for machinery castings, using a high percentage of steel scrap in the charge, also other charges without pig-iron, used for the production of steelworks ingots and s-g iron are described. The results obtained during a period of two years' production of machinery castings, are tabulated, quoting the chemical composition (carbon, silicon, sulphur) and physical tests, *i.e.* tensile strength, Brinell hardness and bend tests. A complete cost evaluation of the basic-cupola process *vis-à-vis* the acid process shows comparable results, in respect of the refractory lining and the metal-charge cost, to be appreciably lower. The report concludes with a forecast of future developments, indicating that a more extensive use of the basic cupola is to be expected.

PHYSICAL PROPERTIES

"Investigation of the Isothermal Changes of Cu-Cr and Ni-Cr-alloyed Cast-iron Containing 0.5 per cent. Mo"

By A. De Sy (Belgium)

The results of the research work presented in this report refer to the investigation of the isothermal transformation of several different cast-irons. One of these cast-irons is unalloyed, the other six each contain 5 to 6 per cent. Mo and 25 per cent. Cr. coupled with varying copper and nickel contents. The main purpose of the research was the investigation of the influence of molybdenum on the diagram for the isothermal transformation. The basic composition of all seven cast-irons investigated, *i.e.* the percentage of the five usual constituents of cast-iron, was kept within very narrow limits.

The Author establishes seven time/temperature/transformation diagrams for the seven cast-irons and discusses the influence of the elements molybdenum, copper, nickel and chromium on the transformation curves. A series of micrographs show the structures which occur with isothermal treatment at various temperatures within the range of 250 and 700 deg. C. and prove the similarity of the structures obtainable by isothermal treatment of molybdenum-containing cast-iron and molybdenum/copper cast-iron respectively. Summing up, the Author expresses the opinion that a cast-iron with additions of Mo and Cr is particularly suitable for obtaining a bainite/martensite structure, with uniform hardness of between 300 and 500 Brinell, according to the temperature applied for the isothermal treatment.

MOULDING METHODS, SANDS AND BINDERS

"Studies on the Evaluation of Moulding Sands"

By H. Jungbluth

The Author begins by saying that W. Reitmeister had, as early as 1927, directed attention to the possibility of evaluating moulding sands, based on "Specific gravity" (the weight of unit of volume), the "specific mould volume" of the rammed sand and the "specific bulk volume" of the loose, uncompressed sand. Reitmeister pointed out that these data can give valuable indications regarding the nature of moulding sand, especially when these values are plotted as functions of the moisture content. Strangely, this sound reasoning has for a long time received little attention, although Reitmeister referred to his ideas again in various later papers. Twenty-five years later, W. Gotz suggested the arrangement of results obtained in testing sand in a system of triangular co-ordinates, in which the incorporation of the "weight of unit volume" was of great importance. This paper shows that Reitmeister's curves which connect "specific mould volume" with moisture content of the sand can equally be established by the German standard testing method. This has been done with three moulding sands, namely, Lorenz-Adler sand, Kindsbacher and Alsenborn natural sand. The same samples were also tested for gas permeability and compressive strength.

Reitmeister concluded from his curves (which relate "mould volume" of "green" or dry moulding sand to its moisture content) that two types of moulding-sand compression curves occur which differ according to the swelling capacity of the sand. He also thought that a close connection existed between the mould volume of dry sand and the gas permeability. The question whether the classification of the sands in accordance with Reitmeister's "types" was correct, useful and necessary, may remain open. However, in general the relation between the "mould volume" of the dry sand and the gas permeability has been confirmed, despite a few exceptions.

Abstracts from the Düsseldorf Congress Papers

Sand Triangle

In this paper, it is shown that valuable as Reitmeister's curves may be, the use of triangular co-ordinates for the presentation of the results of moulding-sand investigations, as suggested by W. Gotz, has distinct advantages. By using the "sand triangle," one can also immediately incorporate the two Reitmeister compression types of moulding sand, if one wishes to accept his assumptions. It can further be seen from the sand triangle that it is more feasible to expect a relation between the weight of unit volume of the dry sand and the gas permeability. This can be deducted from the fact that curves of equal gas permeability run more nearly parallel to the straight lines of equal mineral substances than to the straight lines of equal volume of pores. It was found when investigating the three sands that the relationship was not as close as Reitmeister thought it was.

Finally, it is shown that it is possible to present the compressibility of moulding sands in the sand triangle by plotting curves of equal compression work, *e.g.* represented by three rams and 12 rams respectively of the standard test-piece or loads of 0.5 and 2 cm.-kg. per gm. of sand.

"Calculation of the Riser Neck on Sand Castings"

By R. Namur (Belgium)

The problem dealt with in this report is: A casting moulded in sand has to be provided with a riser in order to compensate for the shrinkage on contraction during solidification; the riser size is carefully calculated beforehand and the dimensions of the connecting channel between the riser and the casting have to be calculated in such a way that perfect feeding of the metal during the time of solidification is guaranteed.

The modulus of cooling of the riser applied is known and may be represented by "Z." Unknown dimensions then are: the dimensions "a" and "b" of the riser at its smallest cross-section and the distance "c" between the riser and the casting, *i.e.* the length of the riser neck. This problem can be solved for all values of a, b and c which conform with the dimensions of one of the following types:—

Type I: $c \geq Z' \frac{ab}{a+b} \geq Z' \left(\frac{2-Z'}{c}\right)$

Type II: $c \leq Z' \frac{ab}{a+b} \geq Z'$

For practical purposes, it is better to remain near to type II, that is, to place the riser close to the casting, but not too close—too short a distance creates sand edges which are too close to the casting. This should be avoided, because such projecting ledges are sometimes difficult to remove from the mould. They create hot spots when casting which can cause open shrinkage cavities and these sand ledges can be torn off and swept into the mould in the casting process.

Recommended Dimensions

The Author recommends the choice of a riser of "standard" shape, which is a cylinder with a convex head, the total height of which is 1.25 to 1.5 times its diameter, D'. For this riser, the modulus of cooling Z' will be $Z' = \frac{D'}{6}$. The recommended neck would fulfil the following condition:—

$$c = \frac{D'}{9} \text{ to } \frac{D'}{6} \qquad a = \frac{D'}{\alpha} \qquad b = \frac{D'}{\beta}$$

$$\text{for } \alpha + \beta \leq 6$$

"Behaviour of 'Green' Moulding Sands as a Result of Shock Heating as it Affects the Occurrence of Surface Defects"

By H. G. Levelink (Holland)

A study is made in this paper of expansion phenomena at the surface of test-pieces of green-sand, exposed to shock heating, in relation to the occurrence of casting defects such as expansion scabs, buckels and rat-tails.

It has been supposed that only a thin layer of sand at the surface of a mould rapidly rises in temperature and simultaneously is prevented from expanding by the underlying layers and the adjacent parts of the mould. In consequence, expansion forces are developed in the surface layer which have to be taken up by the surrounding moulding material.

Particular attention is paid to the adherence of the surface layer to the underlying material. In order to get an insight into the relative magnitude of the expansion forces, comparative measurements were carried out on a few moulding sands. The expansion force was measured on a test-piece fairly evenly heated through the whole section from room temperature up to a temperature above that of the β—α inversion of silica.

In the paper, the behaviour of the surface layer is studied at a flat surface of limited dimensions, but under different conditions, namely: (*a*) those by which the surface layer is allowed to expand freely in the direction of the surface, so that only the underlying moulding material has to take up the expansion force, and (*b*) those by which the same layer is prevented from expanding in the direction of the surface. In this case, also, the influence of a discontinuity in the surface layer and of a local radiation is considered. In the first case, it appears that with many moulding sands, the surface layer peels off from the underlying material as a whole. In the second case, the surface layer may bulge, and tear loose from the underlying material. In some exceptional cases, apparently during peeling off, a rupture in the peel itself occurs, while the separate parts of the peel are remaining flat. A similar phenomenon of rupture may also appear at a discontinuity in the surface layer or at a position of local radiation. The results of these tests justify the supposition that with this phenomenon the separation of the surface layer from the underlying material will happen first. It is probable that

this peel formation leads to the occurrence of various casting defects.

The following properties of the moulding sands —having an influence upon the peel-formation in general—are pointed out by the Author:—(1) The cohesion of the sand in a wet layer which is formed between the dried surface-layer and the moist sand behind—this property is strongly influenced by the type of clay used; and (2) the expansion force, developed by the moulding sands as a result of an impeded expansion. On this property, additions such as wood-flour, pitch and coal-dust have a marked influence.

"Theoretical and Practical Problems of Bentonite Research"

By H. E. Schwiete

This paper begins with a survey of the clay-containing materials, their classification, structure and chemical composition. It deals with the question of substitution and the properties resulting therefrom (cation exchange, swelling capacity). In explaining the special investigation methods which can be used for the evaluation of bentonites, the possibilities and difficulties of X-ray analysis of the mineral content are discussed at length and illustrated by practical examples. The paper points out that X-ray analysis permits of the estimation of impurities in bentonites, quantitatively and with high accuracy. In addition—with a slightly wider range of error—approximate values for the clay mineral-content can also be given.

Thermochemical Methods

The thermochemical methods discussed later in the paper, especially the "dynamic differential calorimetry," can only be used to a limited extent for quantitative estimations. With their aid, however, as well as with X-ray analysis, it is possible to evaluate the homogenity of various bentonite supplies and this is demonstrated by a few practical examples. The behaviour of montmorillonite on heating (up to 1,200 deg. C.), based on X-ray observations, is described and the newly-formed phases found by this method are pointed out.

Finally, the Author discusses ceramic-based methods for the examination of bentonite (estimation of swelling capacity, Enslin value, sedimentation test). In this connection, he reports on recent investigations which relate to swelling capacity (based on estimation of viscosity) and cation concentration. Distinct differences are found between the behaviour of natural sodium and calcium bentonites, and the activated sodium bentonites respectively.

"Investigations on Sand Mixers and Slingers"

By W. Gesell

The Author's preamble states that foundrymen have for a long time paid attention to sand handling because about 50 per cent. of casting faults are ascribed to the moulding sand. Unfortunately, very little has been reported in literature about sand-preparation plants and this is more surprising since problems encountered in mixing are known both in the food industry and the manufacturing technique of plastics. The only existing reference book known to the Author is *Ruhren, Mischen, Kneten*, by H. Fisher. ("Stirring, Mixing, Kneading.") Mixing can be divided into stirring, intermixing and kneading—all three processes aim at the best possible even distribution of the individual components. This homogenity can be better achieved by stirring, mainly of liquid materials, than by intermixing or even kneading of solids. A foundry example of stirring is the preparation of mould dressings and intermixing occurs with the moulding materials for the shell-moulding process. Mixing of other sands is a process lying between intermixing and kneading. Sands with clay-free binders require more intermixing preparation. Clay-bonded sands must be kneaded strongly. Bentonite-bonded sands are nearer to intermixing, "fat" natural sands nearer to kneading.

Mixers can either be constructed as blade mixers or as roll mixers. The former are described as more suitable for intermixing purposes, the latter more for kneading processes. Kneading is the most intensive energy-using of the mixing processes. The place exchange of particles can be enforced by heavy mullers or by relative speed between the kneading elements. "Fat" moulding sand is mostly worked with small mullers and it follows that from the potential energy in this case, the best mixing effect results. The particle compression achieved by mixing must subsequently be relaxed in order to impart flowability to the moulding sand. Sand throwers used for this purpose effect an intermixing with air and a separation of the sand lumps.

Mixers Compared

An investigation of mixers was carried out in order to examine the relation between strength values and maximum homogenity. For the estimation of homogenity, zinc oxide was used as a tracer, which, after preliminary experiments, proved to be a suitable indicator. The results lead to the conclusion that maximum homogenity and maximum strength coincide. An additional result is that the size of the mixing machine influences the characteristic properties of the sand. This further leads to the idea that sand testing in the laboratory can only serve as a guide for the practical preparation for so long as the mathematical relationship regarding the influence of the machine size (say, on the basis of the model range) is not established. This was also confirmed by experiments on four trough-type mixers of varying sizes but of identical construction. The maximum values of compressive strength found by these experiments agreed neither in sequence of time nor in the absolute level. Still more pronounced will be construction differences, *e.g.* of roll mixers, in their effect on specific press-power or in the amount of relative movement of the kneading action. Further experiments showed that after intensive mixing and pug-milling, the clay bond was so well distributed that storage had no essential influence on the sand's characteristics.

Abstracts from the Düsseldorf Congress Papers

The Author compares sand samples kept in air-tight boxes for 24 hours with those from freshly-prepared sand, and states that the increase in strength was only small. Therefore, in a sand system, intermediate storage can be omitted and circulation of the sand accelerated. Under these conditions, sand cooling becomes of increased importance. Experiments with used sand which had been heated to 120 deg. C., showed that sand throwers cooled sand better in direct relation to a higher speed of throw. The heat evaporation is also an important factor in the cooling effect. Detailed investigation into the cooling effect according to the distance of throw, confirmed previous measurements that increase of distance increased the cooling. The question whether various models of slingers would show different results, remains unanswered because it is difficult to adjust these types of machine to give equivalent speeds. On examining the question to what extent the sand grain is crushed, it is reported that increasing the speed of throw increases the destruction of the grain. Better cooling effect and increased grain-splitting therefore run parallel to each other. All additives such as increasing moisture, bonding agents or silt, considerably suppress the tendency to grain destruction. The Author ends by saying that these experiments should stimulate new efforts to deal with questions of sand preparation, as this largely influences the sand properties.

(Abstracts to be continued)

Portrait of James Watt

An error has been pointed out in a "News in Brief" paragraph occurring on page 87 of the JOURNAL, January 17 issue. It would appear from the paragraph that the portrait was of Sir William Paterson, whereas. Dr. Hugh B. Nisbet, principal of the Heriot-Watt College, in drawing attention to the error reveals the history of the portrait in the following terms:—

"Sir Alexander Gray, acting on behalf of Lady Paterson, presented to the governors of the Heriot-Watt College, Edinburgh, on December 7, a portrait of 'James Watt as an Old Man' which had been a prized possession of her late husband, Sir William Paterson, F.H-W.C. This portrait was exhibited at 'The Scottish Exhibition of National History' held in Glasgow in 1911, and again at 'The James Watt Bicentenary Exhibition' held in Greenock in 1936.

"The portrait has been attributed to Raeburn although many art critics who have examined the canvas are unwilling to confirm this finding. It is known that James Watt, when he was eighty years of age, sat for Raeburn and that the artist also made a copy of this portrait for Watt's friend, John Rennie. In the biography of Watt, published by Dickinson & Jenkins, it is related that, when he received his portrait, he remarked 'My Edinburgh picture is come home and is thought like, only it frowns too much.' The portrait now in the possession of the governors could well have merited that description. The whereabouts of the two Raeburns are not known."

Consett Iron's Satisfactory Year

Major development and reconstruction schemes since 1942 have cost the Consett Iron Company, Limited, over £20,000,000. About £12,500,000 has come from the company's own resources including colliery compensation. Part of the finance was provided by a loan of £6,823,000 from ISHRA and repaid when the capital reorganization took place.

In the annual statement, Mr. C. Cookson (chairman), reports that, even after the Iron and Steel Board increased maximum prices of steel products by an average of about 6 per cent., prices of British steel products were still about 8 per cent. lower than their competitors' prices. In the case of some of their products, the difference was considerably more.

All departments of the company were operated at their fullest level during the year ended September 30, 1956. Profits in the first six months showed a marked downward trend, due to dearer materials and higher wages. After all provisions and adding back £69,003 (£112,906) unrequired tax, the net balance of £1,007,574, compared with £761,246 previously when the figure included £218,097 applicable to previous years. The dividend is 7½ per cent.

Iron-ore Imports

Iron-ore imports in December, and the totals for the year 1956 compared with 1955, are shown below.

From	Month ended Dec. 31.	Year ended December 31.	
	1956.	1955.	1956.
	Tons.	Tons.	Tons.
Sierra Leone	60,490	683,591	689,930
Canada	121,556	1,412,672	2,492,395
Other Commonwealth countries and Eire	—	17,295	14,372
Sweden	563,464	4,056,832	4,379,062
Norway	19,478	117,135	120,735
Western Germany	—	37,401	3,200
France	46,119	635,102	592,144
Portugal	12,874	91,908	120,476
Spain	56,613	809,897	827,296
Algeria	106,059	2,123,304	1,421,591
Tunisia	76,190	853,563	799,641
French Morocco	23,125	249,433	380,113
French West Africa	55,450	505,612	613,520
Spanish Morocco	28,365	199,677	270,460
Liberia	25,010	300,456	340,828
Brazil	39,295	519,210	547,048
Other foreign countries	53,945	246,255	739,384
TOTAL	1,088,033	12,859,343	14,352,197

Bright Prospects for Colvilles

In their report for the year to September 30 last, the directors of Colvilles, Limited, of which Sir Andrew McCance, F.R.S., is chairman and managing director, state that the supply of raw materials was satisfactory throughout the year and good trading conditions were maintained. Order-books are full for some time ahead, although there has been some easing in the demand from the automobile industry.

Group output was as follows:—Steel ingots and castings, 1,937,568 tons (1,849,610 tons in the previous year); pig-iron, 741,764 (739,205) tons; coke, 697,044 (664,651) tons. In addition to the increased production of ingots by the group, supplies of ingots were purchased and over 2,000,000 tons were rolled, resulting in an increase of 100,000 tons of finished products delivered from the works.

Equipment & Supplies

High-efficiency Automatic Gas-burners

In order to help alleviate the present oil shortage, G. R. Gilbert, Limited, of Wallington, Surrey, have introduced a new range of high-efficiency gas-burners. These are available in three sizes, their capacities approximately equal 1½, three, and five gallons of oil per hour. The provision of an adjustable stand for the unit, coupled with the fact that the burner feed is extendable from 8 to 36 in., and can be bent, enables these units to be used in place of the existing oil burners, or be kept as reserves (Fig. 1).

FIG. 1.—*Shows the gas-burner developed by G. R. Gilbert, Limited.*

The burners are suitable for use with towns gas of 450 BTU., at a minimum of 2½-in. wg., the gas is introduced into a mixing chamber, together with air from a suitable capacity fan. Flame heads are designed to make full use of the high velocity gas/air mixture, and still retain a stable flame, which neither lifts at maximum aeration, nor lights back with low gas rates. Electrical interlock of controls, it is claimed, provides safety and simplicity of operation.

Thermostats are employed for temperature control can be of the rod, or indicating controller type, control is effected by on-off regulation, a small pilot burner ensures re-ignition.

The smallest units have a thermo electric combustion protection device fitted, whilst the larger units have flame conductance type combustion protection, automatic ignition can only be used with this control.

Contra-rotating Co-axial Shafts

Electropower Gears, Limited, of Kingsbury Road, London, N.W.9, announce the production of contra-rotating co-axial shaft-geared motors and speed reducers. The company states that this new range of reducers has been introduced to supply industries concerned with the mixing of materials and liquids, and it is claimed that they possess advantages over the usual single shaft mixer. The unit comprises a hollow shaft with an internal solid shaft, which are adequately sealed against oil leakage and can revolve at identical or differing speeds. The unit can be supplied with the company's standard gearbox modified on the final gear train so that with a four h.p. drive on the input side, each shaft transmits half of the power, *i.e.*, two h.p.; units are available with power ratings of from ¼ to 25 h.p. supplied with either flange or foot mounting.

Handling Plant

New designs of mechanical handling plant are being introduced almost daily, and amongst those firms making appliances incorporating developments relating to handling and earth-moving devices applicable to foundry practice are the Yale & Towne Manufacturing Company, G. Hunter (London) Limited, and Thwaites Agricultural Engineering Company, Limited. Details of their equipment are given below:

Fork Truck

An electric fork truck of 3½ tons capacity which can make right-angle turns in less than 13 ft. has just been introduced to British industry by the Yale & Towne Manufacturing Company, Wednesfield, Wolverhampton, Staffordshire. The truck, which has been designed for continuous duty, has a wheelbase of only 56 in. The rear wheels turn through 80 deg., and permit the truck to operate in equal aisles of 78 in.

Elevating Truck

The Industrial Truck division of G. Hunter (London), Limited of Fenchurch Street, London, E.C.3, have introduced an improved version of their existing model. It is claimed that the interchangeability of the platform with the forks and jib attachment results in considerable economy in the case of the user having a variety of applications. The capacity remains at 672 lb. and the lifting height at 5 ft. 2 in. The introduction of needle roller bearings in the mast rollers, it is claimed, increases the efficiency of the hydraulic system to 82 per cent.

Dumper

Thwaites Agricultural Engineering Company, Limited, Welsh Road, Leamington Spa, Warwickshire, have increased their range of dumpers by the introduction of a one cubic yard capacity model, known as "Orion." The following features are claimed; a low centre of gravity, resulting in less risk of overturning and consequently higher daily tonnage moved; engine and gearbox placed forward giving good traction even when empty; accessibility of gearbox reducing maintainance costs; the steering is operated from the centre of the axle, resulting in low efficiency losses of the track rod, regardless of position, and improved manoeuvrability.

Extinguishers for Metal Fires

A new, special-purpose fire-extinguisher is now being marketed to meet the difficult problems associated with fire outbreaks involving metals such as sodium and calcium, or magnesium and aluminium in the form of powder or swarf. Manufactured by the Pyrene Company, Limited, the extinguisher (model PDMU 25) is charged with 25 lb. of dry chemical powder which is discharged under the pressure provided by a cartridge of CO_2 gas. The dry chemical powder is applied to the burning metal by an applicator comprising a long tubular metal extension piece, terminating in a cone-shaped spreader. The applicator ensures that the discharge of dry chemical powder is delivered lightly on to the fire in order to prevent the danger of scattering which is associated with this class of fire.

Operation is effected simply by removing the safety clip, detaching the applicator and striking the top of the extinguisher. A "squeeze-grip" control valve enables the flow of dry chemical powder to be shut off at will and to be used to the fullest advantage. Further details of the extinguisher may be obtained from the Pyrene Company, Limited, at 9, Grosvenor Gardens, London, S.W.1.

N. HINGLEY & SONS, LIMITED—Mr. J. L. Grainger has joined the board.

Equipment and Supplies

Grinding Machine

The Addison Tool Company, Limited, of London have given details of a new grinding machine they are marketing for Voka of Vienna. This totally enclosed machine, which is shown in operation, Fig. 2, is a heavy duty production belt grinding machine, which can also be employed as a polishing machine with cloth buffs. It is claimed that due to the built-in dust removal unit it can be operated wherever necessary, this unit has a filter area of 7.2 ft. sq., the fan unit for the dust removal has been placed in the motor space and results in effective cooling for the drive motors, normally three six horse-power motors are used, each spindle is fitted with a separate three stage drive. The company claim that resulting from the mature design, the unit responds smoothly and elastically, and operates under the severest conditions involving great amounts of both dust and swarf.

Further details can be obtained from the Addison Tool Company, Limited, 10, Old Street, London, E.C.4, reference Type D33/ST.

FIG. 2.—*Voka belt-grinding machine in operation, the total enclosure can be seen together with the belt cover.*

Fume-removal Fans

Keith Blackman, Limited, of Mill Mead Road, Tottenham, London, N.17, are now producing a corrosive fume-removal fan, Series 1, it is moulded from PVC material which is highly resistant to chemically corrosive atmospheres. The fan is capable of handling 50 to 180 cu. ft. per min. of gas at pressures up to 1.25 in. s.w.g. The larger, Series 2, fan is also available; further details and specifications may be obtained from Keith Blackman, Limited.

Automatic Spraying & Drying

A new machine has been developed to deal with the automatic spraying and drying of articles on a conveyor-belt system, thereby permitting continuous surface treatment. The plant, known as the Andreae machine, of Swiss design (handled in this country by Lavino (London), Limited, 31/45, Gresham Street, London, E.C.2), is suitable also for stoving many types of articles and can handle metal, porcelain, ceramics, etc., and used for treating any shape of article up to 8-in. dia., 12 in. high or 12 in. deep. The machine is mounted on a tubular frame and the conveyor is arranged as a series of trays on which is mounted a number of spindles, according to the size of the article to be sprayed. When the machine is in motion the spindles revolve, ensuring an even coverage of the article and even drying or stoving when the article is in the oven. The spray booth has an efficient ventilation and filter system and the operator is completely protected from fumes or vapour. The automatic spray-guns are of up-to-date design and incorporate glandless-needle controls. The sprays are adjustable in width and with an internal spray gun the variable angle spray will give a variation of direction up to 90 deg. sideways. The guns can be mounted in a stationary position or with horizontal and vertical movements which can be controlled for speed and stroke. The spray material container will hold 3 gall. and the medium is constantly agitated by a glandless stirring device, driven from the machine without any coupling. The oven can be arranged for infra-red stoving, or convection heating or both (also hot-air circulation). Temperature is controlled by several devices combined and safety switches are incorporated to prevent damage to articles in the oven should the machine stop for any reason.

Automatic Fan-control Unit

Alfred Bullows & Sons, Limited, Long Street, Walsall, have announced the production of an automatic fan-control unit, this equipment automatically switches off the extractor fan in a spray booth when the spray gun is not operating. Time study has shown that in many booths the operator is only using his gun for about one third of the working period. It is claimed that the installation of the equipment will result in considerable economy in respect of heat losses from the factory and power consumption.

The equipment is operated by differential air pressures which actuates a pressure switch *via* a diaphragm cylinder. It is claimed that there is only a two second delay between the operation of the gun and the starting of the fan. The electrical switchgear for use with the fan control must be suitable for automatic operation, and will normally need to be changed to the automatic type when the unit is installed.

Oil Meter

George Kent, Limited, announce the production of a low capacity oil meter. The CM model, as it is called, is a semi-positive rotary piston type, designed for metering supplies of up to 200 gall. per hour, and was developed to meet to-day's greater need to measure and control oil-fuel consumption. It is claimed that the meter retains excellent high flow performance while yet giving low flow rates within two per cent. accuracy. The compact design permits installation in pipe lines of $\frac{3}{8}$ to $\frac{1}{2}$ in. bore, components are manufactured from corrosion-resisting materials and are easily replaceable. Specifications of this meter are available on application to George Kent, Limited, Luton, Bedfordshire.

AIR CONTROL INSTALLATIONS, LIMITED, of Ruislip, Middlesex, are opening a new branch office at Newcastle on January 28: the address is Cross House, Westgate Road, Newcastle-on-Tyne, 1. Telephone: Newcastle 28861.

UK Research on Cast Iron

Much of the current issue* of the *Journal of Research and Development*, published by the British Cast Iron Research Association, is devoted to various aspects of nodular-graphite cast iron. This is all to the good, as recently there has been a reawakening of interest in this material amongst buyers.

The first contribution by Mr. G. N. J. Gilbert and Mr. K. B. Palmer, under the title "Influence of Understressing on the Fatigue Properties of Flake-graphite and Nodular-graphite Cast Irons," has resulted in the following conclusions being drawn:—

It has been shown that understressing for 20-million cycles at a stress 0.5 ton per sq. in. below the fatigue limit has not significantly changed the fatigue limit or the fatigue life at stresses above the fatigue limit, of a series of pearlitic and ferritic flake-graphite and nodular-graphite irons. The flake-graphite irons tested were unalloyed and in the pearlitic condition, a high tensile strength of 20.9 ton per sq. in. was obtained. The nodular irons tested were typical of good as-cast pearlitic and heat-treated ferritic irons. Other investigators have reported increases in fatigue limit in excess of 30 per cent. due to understressing, and in view of this, the results obtained at the BCIRA are rather surprising. The irons tested by Moore, Lyon and Inglis, and Kommers had low tensile strengths and coarse graphite and matrix structures, while the flake irons tested at BCIRA had much superior structures. Test on irons with high carbon contents cast in 3-in. sections to obtain relatively coarse structures are to be carried out at the BCIRA to discover whether the results of the other investigators can be repeated.

The second Paper, of which Mr. G. N. J. Gilbert is the sole author, deals with "Impact Properties of Ferritic Nodular Irons in the Ductile and Brittle Condition, using Standard and BCIRA Impact Specimens." The following conclusions were reached:—

The BCIRA ½-in. by ½-in. V-notched specimen used for research purposes gave the same transition data as the standard 10-mm. sq. beam-type impact specimen. The range of impact values were greater with the BCIRA specimen. These values obtained with the standard 10-mm. sq. beam and cantilever impact specimens, and the 0.45-in. dia. round cantilever specimen correspond closely. It can be concluded that each specimen would have the same transition curve. A ferritic flake-graphite cast iron had slightly higher notched impact values than a nodular iron in the completely brittle condition. The bend test frequently used for testing the ductility of malleable irons is not so rigorous a test for detecting brittleness as the notched impact test.

The third Paper, also by Mr. Gilbert, details a research made on the "Effect of Grain Size on the Mechanical Properties of Ferritic Nodular Irons." In this case the conclusions arrived at were:—

It has been shown that improved tensile and impact properties are obtained if nodular irons are annealed to give a fine (ferrite) grain size. The improvement in tensile properties is indicated by a substantial increase in proof stress, while the ductile-to-brittle transition temperature is decreased in the impact test. Materials are normally annealed to the ferritic condition by holding at a temperature of about 900 deg. C. for a few hours, and then holding at a sub-critical temperature of about 690 deg. C. for a further period. After the 900 deg. C. treatment, materials may be air-cooled and reheated to 690 deg. C. or simply furnace-cooled to 690 deg. C. If the treatment at the high temperature is carried out at temperatures lower than 900 deg. C., some grain refinement is obtained. At a given temperature, providing the material has austenitized completely, finer grains are obtained after a short treatment than after a long one. Very fine grain structures are obtained by holding at a temperature in the austenitic range as close as possible to the upper limit of the critical range. Care must be taken to hold for sufficient time and at a temperature high enough above the critical range to ensure that sub-boundary structures are not obtained in the ferrite grains. Such structures would result in a very marked deterioration in impact properties. The austenitizing temperature chosen for annealing nodular irons may sometimes be selected with the object of decomposing eutectic carbide present in the as-cast structure. This phase will, of course, be less readily decomposed the lower the temperature and the shorter the time. If any attempt is made to produce fine-grain materials, care should be taken to avoid eutectic carbide in the as-cast structure. Further tests are being carried out to see if the fine-grain structure can be obtained in a material previously homogenized at a high temperature in the austenite range (i.e., 900 deg. C.). By this means it is hoped that fine-grain structures may be obtained without the risk of sub-boundary structures.

* Volume six, number nine.

Impurities Affect Mechanical Properties

During an investigation of five commercially-made castings which failed in service, Mr. G. E. Morton found that failure was due to abnormal graphite structures. He details his researches under the title "Influence of Tellurium and Lead on the Occurrence of some Abnormal Formations of Graphite in Grey Cast-irons, and their Effect on the Mechanical Properties." The abnormal forms of graphite were (1) mesh, (2) "spiky," and (3) Widmanstätten, which can arise through the presence of small quantities in cast iron of sulphur, selenium, tellurium, bismuth and lead.

Tellurium, derived from tellurium-bearing mould- or core-washers, or as an addition to the metal; and lead, arises from the use of lead-bearing materials in the charge. The graphite structures observed in the defective castings were successfully reproduced in the BCIRA melting shop and laboratory tests were made on the resulting specimens. It is shown that the presence of these abnormal graphite structures seriously reduces the mechanical strength of grey-iron castings. It was confirmed that such structures can be produced by tellurium either in the form of a mould wash or as a direct addition to the metal, and also by lead. Specimens taken from defective castings containing tellurium and remelted in the crucible showed no improvement in strength, and the graphite structure was unchanged. Similar remelting tests with the lead-containing castings showed some improvement in strength though traces of the original structure remained. The lead content was reduced only by 25 per

Research on Cast Iron

cent. on remelting to 1,450 deg. C., however, and the improvement may thus be due to the metal being cast into a section of different size and cooling rate.

The final contribution is from Mr. F. M. Shaw and deals with "Sulphur in Cupola Stack Gases." This interesting piece of work has shown that:—

The amount of sulphur oxides emitted by cupolas is much less than that emitted from typical, solid fuel fired boilers, burning fuel at comparable rates. Figures from original work and other sources have been used to find the proportion of coke sulphur entering the metal and slag; the remainder is assumed to leave the cupola as sulphur oxides, and in the stack dust. The results are widely scattered but indicate that 40 to 70 per cent. of the coke sulphur is absorbed by the metal and slag, by far the greater proportion going into the metal. Tests on spray-type dust collectors fitted to cupolas, indicate that at least one-third of the sulphur oxides are removed by the spray and never reach the outside atmosphere.

Scotland's Need for Technicians

Scotland has now absorbed a sufficient number of new industries which she can develop successfully without prejudice to her existing industries, and the paramount need at the moment is a big step forward in the technical standard of attainment in industrial management, it is stated by Prof. Christopher McRae, first occupant of the Chair of Industrial Administration at the Royal College of Science & Technology, Glasgow.

Prof. MacRae is seeking to put into practice in his new duties the fruits of his experience over the past 10 years as secretary of the Scottish Council (Development & Industry). In this new atomic age, he said at his headquarters at Chesters Residential Centre, Bearsden, Scotland's future survival as an industrial nation lay in her ability to master the new technique, concentrate on raising the standard of management at top level, and develop the export markets on a greater scale than ever before. Ninety per cent. of the new industries brought to Scotland in the post-war period were science-based, and it was obvious that technological developments must be aligned to a higher standard of industrial management. The speed of modern development was such that management had to be on its toes with the latest "know-how" and be able to seize the new opportunities which science was revealing. Scottish firms, said Prof. MacRae, had not yet realized the importance of the work done at the Centre and it was essential they should send more students. The Centre's primary job, he concluded, was to help Scottish industry, and give assistance in solving its problems.

European "Free Trade" Views

The British Joint Association of Goldsmiths, Silversmiths, Horological and Kindred Trades held their annual banquet in Birmingham on January 19. Mr. C. J. Barber, president of the British Jewellers' Association, pleaded for Governmental recognition of the trade, and urged that the word "luxury," applied to the industry and used to their detriment, be condemned, adding that it justified the heavy purchase tax impositions. The term was not used by other European countries.

Speaking about the proposed free trade area, Mr. Barber referred to a report which the association had submitted to the Federation of British Industries, he said that recognition of the common market was bound to come. His association had asked that certain safeguards be applied, and that such problems as standards of living, hours, wage rates and other factors affecting both employer and worker should be seriously considered. The trade would endeavour to secure as much export sales as possible if the Government opened the door to a common market, but that it wanted to be allowed to remain competitive in the home market.

RTB Report

The iron and steel industry must increase its manufacturing capacity if future demand is to be met. Although there are limiting factors, such as availability of raw materials, there is much that can be done. The part that Richard Thomas & Baldwins, Limited, will play in development of the industry, is indicated by the chairman, Sir Ernest Lever, in his annual statement circulated on January 24.

Two of the main problems were, in what form and where to create new manufacturing capacity. Steps would have to be taken to ensure that the necessary trained personnel was available when needed. Part of the company's policy in this respect was the establishment of a staff training college at Stoke d'Abernon and an apprentices' hostel in Llangattock Park.

Group profit before taxation and allocations for additional depreciation and to reserves was £8,370,245, a decrease of £1,651,175 compared with the previous year. On the discontinuance of the joint selling arrangements between RTB and the Steel Company of Wales, Limited, the merchanting and selling companies in Australia and New Zealand, Canada, and the Argentine had become wholly-owned RTB subsidiaries.

Capital commitments at September 29 were £4,800,000 (£4,140,000). Group fixed assets expanded to £31,091,000 (£27,852,000), and current assets to £34,912,000 (£34,310,000). Net profits declined to £4,313,848 (£5,578,252), after tax of £4,056,397 (£4,443,168). The dividend is 13½ per cent. absorbing £840,576 (same).

Courses in Work Study

The Industrial Engineering department of the Loughborough College of Technology has regularly offered three different types of courses in work study each term, namely—(*a*) management appreciation of two days' duration; (*b*) staff appreciation lasting one week, and (*c*) the main course for the training of practitioners over 10 weeks. It is intended to continue to run courses (*a*) and (*b*) without alteration.

The main 10-week course will continue to be available, but from the beginning of the summer term in May, will be sub-divided into six self-contained courses so that any one may be taken separately if desired. This arrangement is being made to meet specific requests and hence to give better service to industry. The self-contained courses will be: work measurement; work simplification; production planning and control; specialized applications of work study; simplification, standardization, and specialization; communication, motivation and men.

Further information may be obtained from the head of the Department of Industrial Engineering, Loughborough College of Technology, Loughborough, Leicestershire.

Doehler-Jarvis Die-casting Plant

Adoption of Movable Machines Facilitates Maintenance

The Doehler-Jarvis division of the (American) National Lead Company has recently opened a modern aluminium die-casting plant in Stowe Township, just outside Pottstown, Pennsylvania. The building itself has two floors and is a light structure of modern design; it covers an area of 210,000 sq. ft. and cost $5 million to build.

A unique feature of this plant is that the casting machines are each "anchored" at a working place on trolley tracks. (Fig. 1). When an order for die-castings is completed and the respective die is to be dismounted from the casting machine, all lines supplying electric power, hydraulic pressure and water are quickly disconnected and a track-guided trolley which can run the entire length of the building is brought alongside the die-casting machine. The machine is then pulled into the trolley and taken to the servicing department, whilst another machine, with a fresh die for a different casting already pre-heated, replaces the machine which has been withdrawn. The machine which has been removed is then serviced, another die is mounted in place, and made ready for the next interchange of machines. At the end of a production run, the time normally needed to dismount one die and mount another is about five to 20 hours; at this new plant, only about 20 to 30 min. are needed.

Hydraulic System

The hydraulic system used in this plant is claimed to be the most modern in the die-casting industry. A hydraulic pressure of 1,275 lb. per sq. in. is used to force the molten metal into the steel dies. This pressure is created by centrifugal hydraulic pumps and distributed in pipes of 10-in. dia. A central hydraulic section has been installed to house this machinery. The plant is so designed to take advantage of all available space and operations are conducted on a "straight-line" basis. All casting machines are placed in a straight line and trimming operations take place in lines behind the casting machines. After trimming, the castings are machined, inspected, packed and lowered to the loading platform where they are put into lorries.

All the casting, trimming, machining and inspection operations are carried out on the first floor of the building. This system permits the use of the outside trolley in machine exchanges. The ground floor of the building consists of offices, canteen, locker and shower rooms, hydraulic and power areas, and there is a space for displaying the finished products of customers using die-castings.

FIG. 1.—*View of the die-casting machines in the production line on the first floor of the new Doehler-Jarvis foundry. The trolley tracks, on which each casting machine is anchored, are clearly shown. It is also apparent that the holding furnaces are themselves trolley mounted, on lines, so as to be retractable from the machines.*

Book Reviews

Running and Gating of Sand Castings, by R. W. Ruddle, M.A., F.I.M. Published by the Institute of Metals, 17, Belgrave Square, London, S.W.1; price 25s. (post free).

This book is essentially an extension of the Institute of Metals' monograph No. 17—"The Solidification of Castings" by the same author, which appeared in 1950. In a similar fashion to the earlier work, the new book is subtitled "A Review of the Literature," and is said to be "valuable to both the research worker and the practical foundryman." Monograph No. 17, in contrast, was described as: "primarily intended for the research work and should also be of considerable interest to the practical foundryman." In the light of these statements one could reasonably expect a somewhat different treatment in the new book from that which has been given. Research workers usually prefer to consult original papers rather than reviews and whether foundrymen will in fact regard this as a valuable book is uncertain, though their interest in the subject is well known. Not all foundrymen regard themselves as competent to deal with the rigid mathematical treatment which forms the basis of much of the literature in this field, and an attempt to reconcile the "ideal" running systems discussed with the principal industrial techniques now in use would have been most welcome. An acknowledgment that "ideal" gating methods may well be applicable only to castings of "ideal" design would have been no less welcome to an industry mainly based upon jobbing work! Casting design as a vital factor in the production of sound castings is virtually ignored, and the very real fact that the majority of castings are cored is not mentioned. Indeed, were the industry only required to produce the simple shapes discussed in the book under review then running and gating would not be the problem it still is known to be.

Foundrymen are aware that in certain cases a selected running and gating technique clearly unsuccessful for a given casting design is completely successful when a small change is made in alloy composition. The influence of moisture upon dross formation also deserves mention in any publication dealing with running and gating.

J. B. M.

Defects and Failures in Metals by E. P. Polushkin. Published by the Cleaver-Hume Press Limited, 31, Wright's Lane, Kensington, London, W.8; price 72s.

This book has a character of its own, and is a reminder that pre-Revolution Russia had some very good metallurgists. Professor Polushkin was sent to USA during world war I as a Chief Inspector of Metals and stayed there, so he has had plenty of opportunity to survey a host of defects and failures. His correlated observations are sorted out into sixteen chapters, each of which has a standardized arrangement of six sections of text, followed by a Guide to Literature and then the appropriate literature itself in a numbered list. Thus Chapter 2 deals with "Segregation," and its sixth section (as in each chapter) discusses "prevention and elimination" followed by a list of 106 papers. A terrific card index must have been employed, for it appears that altogether 2685 publications are thus recorded in the book.

As a trial, the reviewer professed an interest in the casting defect known as a scab. The Index gives p. 290, where there is a short description of this trouble, whence the Guide to Literature points to papers Nos. 39, 102 and 140. Judging by their titles these appear to fill the bill, and so the system seems to work. For "red shortness" the Index gives four references, and turning to p. 241 one gets some information, including the mysterious sentence "Red shortness of steel may originate in the churned steel turned too cold (18)." Reference (18) does not solve the mystery, even though it is by A. Christie. Considering the very wide scope of this book the plan adopted is a useful one, and permits the enquirer to proceed to more detailed information. The index could do with some extension for a work of this kind. As an example, free-cutting steels (in which segregation defects can occur) are not listed, though additions of sulphur to improve machinability are mentioned on p. 90 in the text.

It is pleasing to find that the work of the older metallurgists like Arnold, Brearley, Howe, Stead and Sauveur has not been forgotten, but the text also contains some rather old-time wording. Strain-hardening is explained by the amorphous metal theory (p. 224), and there seems to be some confusion about slip-bands on p. 225. The age-hardening of Duralumin is explained in simpler terms than will be appreciated by most metallurgists, and strain age-embrittlement does not receive all the attention which it deserves. There are certain obscure passages—as on p. 265, where quenching cracks are being dealt with, and hardenability is said to be an essential requirement in selecting tool steels. Neither the Index nor the Local Guide to Literature gives a lead to hardenability, but readers are told that a tool of deep-hardening steel may spall under high pressure, whilst its surface will cave in if it is made of shallow hardening steel. The reader seems to be left between the upper and the nether millstone.

The book is well produced and amply illustrated—in fact there is a tendency to repetition, *e.g.* three pictures of wrought iron, two of segregated rails and two of phosphide eutectic. There are interesting sections on failures due to corrosion and fatigue, and the foundryman is well catered for. Within the compass of 400 pages a tremendous amount of experience and information has been abstracted and linked together in a logical way.

H.O'N.

New Catalogues

Chemical Laboratory Apparatus. As "Catalogue 565," Griffin & George, Limited, Ealing Road, Alperton, Wembley, Middlesex, have just issued a further edition of their 700-page catalogue. This book is rightly valued in all foundry laboratories not only because of its comprehensive nature, but for the information it contains about the various pieces of equipment listed. Any architect commissioned to design a laboratory could not do better than study the opening section on planning a laboratory. Not only are the general underlying principles detailed but standard units are described and illustrated. All the items listed are priced, but in these days they cannot be guaranteed, and up-to-date price lists are issued when necessary. This is made easy as every item is given a reference number. The acquisition of this catalogue is essential for any laboratory having some pretentions as to modernity and size.

Grinding-wheel Dressers. Danite Hard Metals, Limited, Carr Hill, Doncaster, have used a simple folder to detail the shapes and sizes of a range of standard grinding-wheel dressing tools which they manufacture. The folder is available to readers on writing to the Doncaster address.

Industrial Radiography. The new Kodak catalogue of industrial X-ray equipment and materials is now available to readers; it includes details of the Kodak school of industrial and engineering radiography.

New Non-destructive Test for Magnesium-alloy Castings*

By G. R. Vanduzee

The use of magnesium-alloy castings at high-stress levels necessitates non-destructive-testing procedures to indicate casting quality. Among these procedures, (USA) government aircraft requirements include the use of penetrant inspection on certain classes of non-ferro-magnetic alloys. Commonly, penetrant inspection methods depend on the use of a fluorescent material. Fluorescent penetrant is quite satisfactory in locating defects in some castings but has certain undesirable features. These include (1) use of special lighting conditions (2) effect of surface condition of casting and rinsing on retention of penetrant (3) smearing of penetrant during handling (4) uncertainty that surface has been inspected completely because of casting contours (5) observation of internal surfaces difficult because of use of near-ultraviolet light and (6) absorption of penetrant by foreign materials on the surface leading to false indications.

New Method

To overcome the disadvantages of the fluorescent method, one user of magnesium castings has developed a different procedure. This is based on bleed-out of penetrant and is similar to the procedure used successfully for indicating surface defects on anodized aluminium. Although various combinations of chemicals and procedures can be used, the following method has produced dependable results with the least difficulty in application.

The casting is treated in a solution containing 5 per cent. by volume of 66 deg. Bé sulphuric acid for sufficient time to remove about 0.004 in. from the surface and rinsed in cold water. The surface is then cleaned by immersion for two min. in a bath containing 15 per cent. by weight of hydrofluoric acid and rinsed again in cold water. At this stage, the surface is clean and silvery in appearance. The casting is then immersed for three min. in a bath containing 5 lb. of chromic acid and 38 ml. of nitric acid per gall., given a cold water rinse followed by a hot water rinse and is ready for inspection. After treatment, surface defects are indicated by the bleeding of chromic acid to produce an amber stain against the silvery background. All defects common to the surface of magnesium-alloy castings are readily found by this procedure. The process has even permitted the location of cracks which had been missed in fluorescent-penetrant inspection. The surface indications are evaluated by the procedures used with fluorescent methods.

Advantages

The advantages of the new procedure over fluorescent penetration methods are:—

(1) A surface defect is indicated by a stain visible under ordinary lighting conditions, thus lessening the possibility that defective areas will be missed.

(2) The etching action provides uniform surface with no retention of penetrant except in defective areas.

(3) Smearing due to handling is not a factor since bleed-out produces a permanent stain.

(4) The silvery background of the casting and the contrast of stains in defective areas permits easier examination of internal surfaces.

(5) The chemical action of the process removes foreign materials on the surface and eliminates false indications from that source.

(6) The surface colouration and lighting conditions minimize operator eye-strain and increase dependability of the inspection.

In addition to the advantages listed, it has been found that some superficial flaws shown by fluorescent-penetrant methods are eliminated by the removal of 0.004 in. from the surface, thus avoiding the necessity of grinding them out.

Other Factors

Although this inspection method can be used satisfactorily on most raw castings, there are objections in certain instances. When castings are produced by a method designed to give a smoother surface than sand casting, the etch inspection should not be used unless the etched surface produced is acceptable. Dimensional tolerances must also be considered since the procedure will remove approximately 0.010 in. from the section thickness.

Any inspection procedure, to be of the utmost value, should be applied as soon as possible to avoid building up costs on a defective part. The new inspection procedure can and should be applied at the foundry so that personnel responsible for producing castings can see the casting flaws and make appropriate changes in foundry practice to eliminate them.

* Reproduced from *Materials and Methods*. The Author is senior materials engineer, Sikorsky Aircraft Division, USA.

THE ADDRESS of Mr. N. C. Fisher is now Broadwater House, Sheffield Park, Uckfield, Sussex.

Mr. J. ROY GORDON has been elected executive vice-president of The International Nickel Company of Canada, Limited, Mr. JOHN F. THOMPSON, chairman of the board, and Mr. HENRY S. WINGATE, president. Mr. GORDON has also been elected executive vice president of The International Nickel Company, Inc., the company's United States subsidiary.

OUTPUT of iron ore in the European Coal and Steel Community, in 1956, reached a new record level of 80,743,000 metric tons, according to provisional figures released by the Statistics Division of the High Authority. This represented an increase of 6.2 per cent. over the 1955 figure of 76.028.000 metric tons. The breakdown by countries for 1956 and 1955 shows that the biggest increases were in Belgium (37.7 per cent.) and Italy (23 per cent.).

News in Brief

LEICESTER has set up a special sub-committee to deal with the establishment of the city's first smoke-controlled zone. It includes representatives from Health, Housing, and Finance committees.

THE product engineering design responsibilities for the new B-250 tractor of the International Harvester Company of Great Britain, Limited, have been transferred to the Bradford works, where a new engineering section is being created.

THE PRICE of platinum in the UK free market is now indicated at from £35 to £35 10s. per troy ounce compared with £35 10s. to £36 5s. previously. The official price of the major London dealers is unchanged at £34 per troy ounce.

A CONTRACT worth £131,000 has been won by Acrow Engineers (Export), Limited, to supply steel formwork, etc., for a NATO project in Turkey which is being carried out by Costain-John Brown, Limited, and Williams Bros., Tulsa, Oklahoma.

THE CONSTRUCTIONAL STEEL DIVISION of the Palmers Hebburn works of Vickers-Armstrongs (Shipbuilders), Limited, are to receive contracts for the whole of the constructional steelwork for the Nuclear Power Station at Berkeley, on the estuary of the River Severn, in Gloucestershire.

FOR THE FIRST TIME since early 1954 there are more unemployed than there are vacancies. Numbers on short time have reached last July's peak total of 140,000. About 1.4 per cent. of the working population is unemployed (297,000) and unfilled vacancies amount to 279,000.

THE Crest Shipping Company of the Bahamas has placed an order worth over £1,000,000 with Lithgows, Limited, Port Glasgow, for what is believed to be the largest free-piston gas turbine powered vessel in the world. The Free Piston Engine Company, Limited, will supply the free-piston gasifiers.

THE BUSINESS of J. Wakefield & Sons, Limited, recently acquired by Hale & Hale (Tipton), Limited, was established in 1870, and manufactures oil lamps and burners. The undertaking is to be reorganized so as to improve its service and to benefit the output of another member of the Hale group, Chatwins, Limited.

AITON & COMPANY, LIMITED, Sunderland, which has opened a factory in South Africa, has obtained a contract from the South African Government for the supply of alloy pipes to carry high-temperature steam for the Athlone power station, Capetown province. Part of the work will be carried out in South Africa and part in Sunderland.

AN EXHIBITION, "The Scientist at Your Hearth," to be held by the Solid Smokeless Fuels Federation at Charing Cross Underground Station, London, from February 4 to 23, will feature a laboratory testing natural and manufactured solid smokeless fuels. Solid-fuel burning appliances and authorized fuels will also be featured.

THE Universal Asbestos Manufacturing Company, Limited, Watford, announces that the prices of its asbestos cement products will be increased by between 7½ and 8 per cent. as from February 18. Export prices will not be affected. No increase in the prices of the company's products has been made since December, 1955.

BORAX CONSOLIDATED, LIMITED, operating subsidiary of Borax (Holdings), Limited, have recently acquired research laboratories at Tolworth, in Surrey, to provide facilities for a staff of 50 chemists. The new laboratories, together with those at Belvedere, Kent, provide room for a greatly expanded programme of research in boron chemistry and in other fields.

VALUE OF NEW ORDERS received in October by the machine-tool industry was nearly £600,000 more than in September. October orders totalled £6,839,000, compared with £6,240,000 in September and £6,370,000 in August. Deliveries in October, at £7,788,000, were higher than new orders for the second successive month. The industry's total order-book on October 31 was worth £101,598,000.

THE BOARD OF TRADE announce that they are to sell 30,000 tons of lead for delivery and pricing over a period of nine months beginning in March. Some 4,000 tons of this will be offered by open competitive tender, and the remainder, to which special considerations apply, will be offered back to the original suppliers or their agents. The availability of tender forms for the 4,000 tons will be advertised in due course.

THE TOTAL REFINED ZINC production in OEEC producer countries, Austria, Belgium and the Belgian Congo, France, Germany, Italy, Netherlands, Norway and the United Kingdom amounted to 72,368 metric tons in December, 1956, as compared with 66,109 metric tons in November 1956. Total 1956 production amounted to 815,912 metric tons (high grade and special high grade 312,371; others 503,541), compared with 765,438 metric tons in 1955.

THE BOARD OF TRADE, with the help of the Council of Industrial Design, will again be providing a United Kingdom section in the Palace of Nations at the Milan Fair, which will be held from April 12 to 27. The stand will be devoted to a display of modern British design in consumer goods. Buyers will attend from all over Europe and therefore the goods will be chosen with reference to European markets in general, but with the Italian market particularly in view.

R. F. OTTINGNON & PARTNERS, LIMITED, have inaugurated a service of interest to iron and steel founders, designed to reduce the prevalence of silicosis in the industry. This is to be effected by periodic inspection, recommendations regarding the additions and alterations to existing equipment and assistance in the installation of protective equipment. The company will provide foundries with legal and medical advice. Further details of the scheme may be obtained from the company at 23A, High Street, Baldock, Herts.

Brook Motors, Limited, have recently organized their own unit for making 16 mm. films, this is operated in conjunction with the Publicity and Photographic Departments of the company. The first production is a 20 minute black-and-white sound film "Winding Journey" which covers the methods of work handling at the firm's Barnsley factory. An older motor-winding department is contrasted with the electronically controlled conveyor system in the newer factory. Copies of the film are now available on free loan from the Publicity Department, Empress Works, Huddersfield.

THE EXPORT CREDITS GUARANTEE DEPARTMENT, announcing details of their "commercial" business (under Section 1 of the Export Guarantees Act), report that the number of short-term policies current at the end of the fourth quarter of 1956 was 4,112 compared with 4,026 at the beginning of the quarter, and 3,904 at the end of the corresponding quarter last year. The face value of short-term policies current at the end of the quarter was £546.6 millions; compared with £534.5 millions at the beginning of the quarter, and

£489.8 million at the end of the corresponding quarter last year.

AMONG EQUIPMENT ON DISPLAY at the "Gas at Work in Industry" exhibition (currently being held at the Horticultural Hall, Westminster, London, S.W.1) in which founders have taken special interest, are the temperature recorders, gas-fired furnace-control equipment, and combustion safe-guard unit made by Honeywell-Brown, Limited; a range of electro-gas heating equipment by Standard Telephones & Cables, Limited; and the lip-pour Morgan crucible furnace, type "HLP" Mk. 11. It is expected that over 10,000 will have visited the exhibition by the time it closes on February 2.

AT THE MEETING of the junior section of the Birmingham and District Industrial Safety Group on January 16, Mr. L. C. Bidmead, the chairman, said that there were more that 200,000 eye injuries each year in British factories, and many such accidents were said to be caused by failure to wear goggles when using a dry grinding wheel. Mr. K. O'Leary, assistant personnel manager of Chance Brothers, Limited, reported that as a result of training courses, accidents in the Birmingham area caused by power presses had been reduced from 500 a year to 150. At the annual general meeting, the secretary, Mr. G. M. Hopps, announced that the Group would be holding their fourth exhibition at Bingley Hall, Birmingham, next June.

Increases in Capital

TENSOMETER, LIMITED, engineers, etc., of Croydon, increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

J. C. BAMFORD (EXCAVATORS), LIMITED, Rocester, Uttoxeter, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £50,000.

FLUIDRIVE ENGINEERING COMPANY, LIMITED, Isleworth (Middx), increased by £350,000, in £1 ordinary shares, beyond the registered capital of £250,000.

INDIAN COPPER CORPORATION, LIMITED, London, E.C.2, increased by £1,000,000, in 2s. unclassified shares, beyond the registered capital of £1,000,000.

DENFORDS ENGINEERING COMPANY, LIMITED, Wheatley, near Halifax, increased by £38,000, in £1 ordinary shares, beyond the registered capital of £12,000.

PREMIER SCREW & REPETITION COMPANY, LIMITED, Woodgate, Leicester, increased by £100,850, in £1 ordinary shares, beyond the registered capital of £3,000.

HATCHETT & COMPANY, LIMITED, engineers, etc., of Hyde (Ches), increased by £45,000, in £1 ordinary shares, beyond the registered capital of £40,000.

WALPOLE PLACE ENGINEERING COMPANY, LIMITED, London, S.E.13, increased by £40,000, in £1 ordinary shares, beyond the registered capital of £10,000.

LAURIE & STUART, LIMITED, engineers, machinists, etc., of London, E.C.2, increased by £37,000, in £1 ordinary shares, beyond the registered capital of £3,000.

GARDINER & GULLAND, LIMITED, sheet metal workers, etc., of London, S.E.13, increased by £49,500, in £1 ordinary shares, beyond the registered capital of £6,500.

LA MONT STEAM GENERATOR, LIMITED, Wembley (Middx), increased by £83,250, in 1,665,000 ordinary shares of 1s., beyond the registered capital of £16,750.

HALL & RICE, LIMITED, ironfounders, wire drawers, nail manufacturers, etc., of West Bromwich, increased by £90,000, in £1 ordinary shares, beyond the registered capital of £10,000.

CAFFIN & COMPANY, LIMITED, railway, electrical, mechanical contractors, etc., of London, W.C.2, increased by £10,000, in £1 5½ per cent. redeemable non-cumulative preference shares, beyond the registered capital of £60,000.

J. GLOVER & SONS, LIMITED, ironfounders, mechanical engineers, etc., of London, S.W.18, increased by £18,000, in 200,000 "A" ordinary and 160,000 "B" ordinary shares of 1s. each, beyond the registered capital of £17,000.

NORTONS-TIVIDALE, LIMITED, colliery and structional engineers, etc., of Tividale (Staffs), increased by £79,600, in 54,600 7½ per cent. cumulative redeemable preference and 25,000 ordinary shares of £1, beyond the registered capital of £150,000.

Notes from the Branches

Coventry Section

At the meeting held by the Coventry and District section of the Institute of British Foundrymen, (Birmingham branch) on December 11, held in the local Technical College, Mr. K. Marston presented a paper entitled:—"The Design of the Pattern Equipment and the Foundry Technique Used to Produce an Aero-engine Casting." The casting which was to be used in a turbo-jet engine, and of very intricate design, was made in a magnesium-zirconium alloy.

Mr. Marston explained, with the aid of slides, the manner in which various difficulties encountered in the design and manufacture of corebox equipment were overcome. He also made reference to the use of CO_2-bonded cones. The section of the paper dealing with the foundry technique employed was due to be given by Mr. F. McKenning of High Duty Alloys, Limited, who, unfortunately, was unable to be present. In his absence, Mr. Marston read it for him.

A lively discussion followed. A vote of thanks was proposed by Mr. T. Weaver, president of the Birmingham branch, and this was seconded by Mr. P. Browne, The section president, Mr. D. R. Fardoe, was in the chair. Mr. Marston, who holds the position of Pattern-shop Superintendent at Armstrong Siddeley Motors Limited, Coventry, is a member of the section Council and is the first from that body to give a paper to the section.

South Africa

A programme booklet has been issued, by the South African branch of the Institute of British Foundrymen for the period January to June 1957. It lists the following forthcoming lectures: February 28: "Castings in the Production of South African Gold," by H. J. G. Goyns and J. Steele (branch exchange paper to the Victoria (Australia) conference); March 28: "Mechanization for Shell moulding" by K. H. Combs; April 25: "The Basic Cupola, its Design and Operation" by Dr. J. H. Cannon and A. L. Bradley; May 23: "Foundry Mechanization" by H. A. Godwin, and June (exact date not settled) annual general meeting and dinner. There is also printed a message from the branch president Mr. G. F. Alexander, lists of past and present branch officials, recipients of branch awards and rules for membership are included and finally a complete list of members of the branch. The branch has scheduled two works visits; the first, on February 21, is to the Randfontein Estates Gold Mine (which has its own foundry producing iron, steel and non-ferrous castings); and the second to Polygram Shell Mould Company (Pty) Limited at Germiston on April 13.

Recent Wills

DOWNS, HORACE, of Huddersfield, founder of H. Downs & Sons, ironfounders, of Apsley, Huddersfield ... £5,057

DORMAN, SIR BEDFORD LOCKWOOD, of Enterpen, Hutton Rudby (Yorks), son of the founder of Dorman, Long & Company, Limited, Middlesbrough ... £64,318

LEWIS, J. J., of Penarth (Glam), formerly for more than 50 years associated with the Cardiff Channel Dry Docks & Pontoon Company, Limited, and Mountstuart Dry Docks, Limited, Cardiff ... £3,540

BYNG, GEORGE WEST, chairman of the Tees Conservancy Commission, 1945-51, late director of Dorman Long & Company, Limited, of Thomas Hunter, Limited, railway wagon builders, of Rugby and Leamington Spa, and of Redpath, Brown &. Company, Limited £28,479

Pig-iron and Steel Production

Statistical Summary of November Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in November, and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in November, 1956, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	Basic[1] materials (excl. fuel).						Imports.[2]	Prod. Ingots, castings.	Delivrs. finished steel.	Stocks.[3]
1953 ..	260	350	506	304	207	237	215	188	17	339	262	962
1954 ..	263	364	498	299	234	238	229	198	7	356	277	931
1955 ..	276	399	529	311	244	246	240	213	29	381	305	1,183
1956—June	300	461	539	302	256	252	240	209	27	380	324	1,315
July	300	463	535	288	252	258	240	179	24	326	275	1,334
Aug.[4]	300	463	541	279	258	259	236	179	18	341	227	1,499
Sept.	300	464	545	301	269	367	253	231	18	417	330	1,453
Oct.[4]	300	464	540	317	279	266	261	229	21	419	328	1,381
Nov.	300	469	552	328	275	262	263	234	16	426	—	1,336

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in November*, 1956.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	4.0	15.1(basic)	2.7	0.2	20.4	1.6	22.0
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.1	35.5	—	2.7	0.4	38.2	1.5	39.7
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	43.2	—	—	0.1	43.1	0.2	43.3
North-East Coast	1.1	79.2	—	1.6	0.5	80.2	2.2	82.4
Scotland	2.9	45.8	—	2.8	0.5	49.5	2.5	52.0
Staffs., Shrops., Worcs. and Warwick ..	—	21.7	—	1.2	0.7	21.8	1.8	23.6
S. Wales and Monmouthshire	5.2	84.6	6.9 (basic)	1.3	0.2	97.4	0.8	98.2
Sheffield (incl. small quantity in Manchester) ..	8.8	35.4	—	12.7	0.4	55.3	2.0	57.3
North-West Coast	0.1	2.1	5.0 (acid)	0.6	0.1	7.7	0.2	7.9
Total	19.2	351.5	27.0	25.6	3.1	413.6	12.8	426.4
October, 1956[4]	19.9	343.8	27.2	25.1	3.1	406.5	12.6	419.1
November, 1955[4]	20.9	333.8	27.0	23.7	3.2	396.3	12.3	408.6

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel.*

Product.	1954.	1955.	1955.	1956.	
			October.	Sept.	Oct.[6]
Non-alloy Steel:					
Ingots, blooms, billets and slabs[5]	5.1	4.9	5.3	5.3	5.1
Heavy rails ..	9.6	9.4	9.8	11.1	10.1
Sleepers, etc. ..	1.9	2.0	1.7	1.2	1.8
Plates, ⅛ in. & over	47.0	46.1	51.6	55.3	54.7
Other heavy prod.	45.8	47.8	52.7	52.9	52.7
Ferro-concrete bars and rods ..	5.9	7.0	7.1	8.2	8.8
Wire rods (incl. coiled rods ..	19.7	22.2	24.1	23.1	23.6
Light rolled prod...	41.2	46.4	51.2	54.9	56.5
Bright steel bars ..	6.3	7.8	8.4	7.9	8.0
Hot-rolled strip ..	21.7	24.1	26.4	26.4	26.1
Cold-rolled strip ..	7.0	8.1	9.1	7.6	6.7
Sheets (incl. coated)	38.8	42.7	44.4	42.7	41.9
Tin. terne and blackplate ..	16.8	17.0	16.7	18.6	19.2
Steel tubes, pipes	20.0	22.9	24.5	27.2	26.2
Tube, pipe fit'gs ..	0.4	0.4	0.5	0.5	0.5
Tyres, wheels, axles	4.7	4.8	5.1	4.4	4.7
Forgings (excl. drop forgings) ..	2.6	2.5	2.9	3.4	3.0
Steel castings ..	4.0	4.2	4.6	5.0	5.0
Tool and magnet steel	0.2	0.3	0.4	0.3	0.3
Total	298.7	320.6	346.5	356.0	354.9
Alloy steel	13.6	15.8	17.4	19.2	17.5
Total deliveries from U.K. prod.[6] ..	312.3	336.4	363.9	375.2	372.4
Add: Imported finished steel ..	5.0	18.8	24.5	13.6	12.1
	317.3	355.2	388.4	388.8	384.5
Deduct: Intra-industry conversion[7] ..	41.9	50.9	58.5	60.4	57.8
Total new material ..	275.4	304.3	329.9	328.4	326.7

TABLE IV.—*Production of Pig-iron and Ferro-alloys during November* 1956.

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	27	—	28.1	25.1	0.3	—	53.5
Lancs. (excl. N.W. Coast), Denbigh. Flints, and Cheshire ..	7	—	19.6	—	—	1.6	21.2
Yorkshire (excl. N.E. Coast and Sheffield) ..	—	—	—	—	—	—	—
Lincolnshire ..	9	—	36.4	—	—	—	36.4
North-East Coast	20	4.8	49.9	—	—	—	54.7
Scotland	9	0.7	16.4	1.9	—	—	19.0
Staffs., Shrops., Worcs., and Warwick ..	7	—	9.7	1.5	—	—	11.2
S. Wales and Monmouthshire	11	4.7	36.9	—	—	—	41.6
Sheffield	2	—	3.4	—	—	—	3.4
North-West Coast	8	20.6	—	—	—	1.1	21.7
Total ..	100	30.8	200.4	28.5	0.3	2.7	262.7
October, 1956[4] ..	98	32.7	198.0	26.1	0.5	3.4	260.7
November, 1955[4]	100	29.3	190.2	29.3	0.8	3.0	252.6

[1] Used in non-food manufacturing industry.
[2] Weekly average of calendar month.
[3] Stocks, mainly ingots and semi-finished, at the end of the years and months shown.
[4] Five weeks, all tables.
[5] Other than for conversion into any other form of finished steel listed.
[6] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.
[7] Material for conversion into other products also listed in this table.

Personal

Sir ARTHUR WHITAKER has been elected president of the Institution of Civil Engineers in place of the late Mr. H. J. F. GOURLEY.

Mr. WILLIAM SPENCE has been appointed manager of the industrial engineering department of the British Thomson-Houston Company, Limited, Rugby.

John I. Thornycroft & Company, Limited, announce that Admiral Sir WILLIAM G. ANDREWES, K.B.E., C.B., D.S.O., has been appointed to the board of directors.

Mr. J. S. BRIGHT has been appointed general manager of F. Perkins (Canada), Limited, Toronto, subsidiary of F. Perkins, Limited, Peterborough, manufacturers of diesel engines.

Mr. P. C. JONES, sales director of Allen West & Company, Limited, is retiring on January 31, after 45 years' service with the company. He will be succeeded by Mr. J. H. HALL.

Mr. L. BAILEY has been appointed works manager of United Steel Structural Company, Limited, Scunthorpe, with effect from January 1. He was formerly production manager.

British Oxygen Gases Limited have appointed Mr. LEONARD B. SMITH as superintendent of the general service section of the sales technical service department at Cricklewood.

Mr. H. F. BIBBY, assistant general manager, and Mr. G. H. JOLLEY, principal representatives of the export company have been appointed to the board of Metropolitan-Vickers Electrical Export Company.

Mr. M. M. HALLETT has replaced Mr. V. C. FAULKNER as the British representative on the International Committee of Foundry Technical Associations. Mr. Faulkner has held the position since 1927.

Mr. J. W. WHIMPENNY, managing director of W. H. Dorman & Company, Limited, Stafford, left the week ending January 19 for a business tour to South Africa. He is to visit the company's agents and engine users.

Mr. DUNCAN CAMPBELL, chairman of Charles Carr Limited, and the Non-Ferrous Casting Company (Birmingham) Limited, is leaving on February 14 for a business tour of the West Indies and Central and South America.

Mr. EDWIN TAYLOR, has retired after 49 years with A. Reyrolle & Company, Limited, Hebburn-on-Tyne. He was machine-shop superintendent. He is one of three brothers who have served Reyrolle's in official positions for many years.

Mr. ALEC W. STONES has been appointed manager of the Western district of British Oxygen Gases, Limited, at Birchgrove, Cardiff. He replaces Mr. J. E. CLARK, who has taken an appointment with British Oxygen Wimpey, Limited.

Mr. W. H. MCFADZEAN, chairman and managing director of British Insulated Callender's Cables, Limited, left London on January 19 for a tour of BICC group organizations in Pakistan, India, Singapore, Australia, New Zealand, and North America.

The services of Mr. J. BURNETT as secretary of Sheffield Metallurgical Association were recognized at the Association's annual meeting on January 22 when he was presented with a wrist watch. Mr. Burnett has relinquished his secretarial duties in order to become treasurer.

Mr. J. G. BUXTON, managing director of Brass Founders (Sheffield) Limited, presented gold watches on January 25, to three of the firm's employees for long service. They were Mr. O. CREHAN (38 years), Mr. G. A. RALPH (26 years), and Mr. A. WOLSTENHOLME (26 years).

Mr. G. A. HANNAH managing director of Pegson, Limited, has succeeded Mr. E. S. EVERITT as president of the Federation of Manufacturers of Contractors' Plant. Mr. B. N. JOLLY, director and general manager of E. Boydell & Company, Limited, has been appointed vice-president.

Mr. J. RAYMOND and Mr. F. R. M. PRESTON have joined the board of Hayward Tyler & Company, Limited, following the purchase of the major interest in the company by Platt Brothers & Company (Holdings) Limited. Mr. Raymond has been elected chairman of Hayward Tyler.

English Steel Spring Corporation, Limited, announce the following appointments:—Mr. R. FIELDING as superintendent of the springs departments at Grimesthorpe and Tinsley; Mr. H. BRADLEY as manager of the department at Grimesthorpe, and Mr. P. FOX as sales manager for the Corporation.

Mr. C. W. BIGG is to retire from the directorate of Ley's Foundries & Engineering Company, Limited, and its associate companies. It is expected that his retirement will take effect from sometime in February. During the last war Mr. Bigg was Director of Iron Castings under the Ministry of Supply.

The General Electric Company, Limited, announces that Mr. R. N. MILLAR has been appointed assistant general manager of Fraser & Chalmers Engineering Works, Limited, as from January 1. Mr. Millar will continue to be manager of the GEC Simon-Carves Atomic Energy Group which is centred at Erith.

Mr. NORMAN MACDONALD has been appointed works manager at the Fraserburgh factory of Consolidated Pneumatic Tool Company, Limited. He succeeds the late Mr. A. M. Vass. Mr. Macdonald joined the company at Fraserburgh in 1925 as a draughtsman and has held various appointments with the firm in London and Fraserburgh.

Mr. D. F. W. MCNAIR, export sales manager of the Peterborough diesel-engine manufacturing firm of F. Perkins, Limited, is now in the United States in search of new markets. Among his appointments is a visit to the Chicago Road Show, where he will be joined by the company's deputy managing director, Mr. M. I. PRITCHARD.

Mr. PAUL BAKER, director and works manager of the Hebburn-on-Tyne (Co. Durham) works of Baker Perkins, Limited, manufacturing engineers, etc., has retired. Mr. Baker, who joined the firm in 1914, had been at the Hebburn works for 10 years and before then was at the main works at Peterborough. He had also represented the company's interests in the US.

Mr. ERIC S. FRANKLIN, managing director of Torrance & Sons, Limited, has now joined the board of the parent company, Stothert & Pitt, Limited, and is retaining his responsibility for the Torrance company. Major General G. L. WATKINSON and Mr. R. A. RIDDLES, who are both directors of Stothert & Pitt, have been appointed directors of the Torrance concern.

The Lord MILLS has resigned as a director and as chairman of Lancashire Dynamo Holdings, Limited, on his appointment as Minister of Power. Mr. S. F. STEWARD, the group managing director, has succeeded Lord Mills as chairman. Mr. Steward was previously chairman of the South Western Electricity Board.

Personal

The work of being in charge of the demolition of the 190-ft. high, 24-ft. dia. chimney at Stanton Ironworks last year has gained steeplejack, 62-year-old FRED HERAPETH, of M. Macdonald & Company, Limited, Bennett Street, Mapperley, the prize for the outstanding steeplejack of the year. He was presented with the Congreve Trophy and £20 in saving certificates.

Mr. P. TURRELL has been appointed general superintendent of the English Steel Rolling Mills Corporation, Limited. Mr. H. GREGORY relinquishes his position as melting shop manager and has been appointed as Mr. TURRELL'S adviser. Mr. E. PINDER is joining the company as manager to the melting shop, and Mr. S. F. BETTS has been appointed as cost accountant.

Mr. P. B. H. BROWN, deputy chairman and managing director of L. Sterne & Company, Limited, refrigeration machinery manufacturers, of Glasgow, has been nominated by the Scottish committee of Lloyd's Register of Shipping to the general committee of management in London. Mr. Brown is also a director of Worthington-Simpson, Limited, pump manufacturers, of Newark (Notts).

To acknowledge his services as secretary of the Yorkshire branch of the Institution of Mechanical Engineers, a presentation has been made to Mr. W. JOHNSON. He recently left Sheffield University, where he was a lecturer in the mechanical engineering department, to become senior lecturer in mechanical engineering at Manchester University. The presentation was made by Mr. T. A. Crowe (president).

A former Civil Servant who does not believe that retirement necessarily implies inactivity and rustication is Sir GODFREY INCE, until January of last year Permanent Secretary, Ministry of Labour and National Service. He is chairman of Cable & Wireless, Limited, and its associated companies, a director of the Temperance Permanent Building Society, and has now been elected a director of the Dowty Group, Limited, manufacturers of hydraulic, mining, and aircraft equipment, etc., of Ashchurch.

The Council of the Institution of Mechanical Engineers have awarded the 1957 James Watt International medal to Professor Dr. Ing. WALTHER BAUERSFELD, of Zeiss-Werke, Germany, in recognition of his work as a scientist, inventor, and successful organizer, particularly in the application of precision engineering in the field of optics. Professor Bauersfeld is arranging to come to London in early May to receive the medal at the Institution, and will also deliver a lecture bearing on his work.

Mr. K. KLOUMAN, vice-chairman of J. Blakeborough & Sons, Limited, valve manufacturers, of Brighouse, presented long-service awards to four serving employees and one former employee, now retired, who had completed 50 years' service with the firm. The recipients were Mr. GEORGE BROOK (retired); Mr. GEORGE FIRTH; Mr. JOHN MILNES; Mr. GEORGE SPENCER; and Mr. CLIFF WOOD. In addition four serving employees received awards for 40 years' service and there was a similar number of awards for 25 years' service.

Mr. J. D. PEATTIE, acting chief engineer of the Central Electricity Authority, who has been appointed chief engineer retrospectively as from January 1, 1956, retired at his own request on January 24. He will continue to serve in a consultative capacity. Mr. F. H. S. BROWN, generation design engineer, has been appointed in his stead. Mr. E. S. BOOTH, generation station construction engineer, has been appointed deputy chief engineer (design and construction) and Mr. J. C. DUCKWORTH, nuclear power engineer, has been appointed deputy chief engineer (nuclear power).

The following appointments have been made to the board of Imperial Chemical Industries, Limited, as from January 24: Dr. R. BEECHING is now technical director; Dr. J. FERGUSON, research director; Mr. C. M. WRIGHT, development director; and Mr. L. H. WILLIAMS becomes director in charge of group B—dyestuffs and pharmaceuticals, with effect from April 1 on the retirement of Mr. P. K. STANDRING. On the main board of the company, Mr. J. L. S. STEEL has been appointed economic planning director, and Mr. C. PAINE, previously development director, succeeds Mr. Steel as group A (heavy chemicals) director.

Mr. W. W. BRAIDWOOD of the development and research department, Mond Nickel Company Limited, is to leave on February 1, on a business trip to India, Australia and New Zealand. During his tour licensed producers of spheroidal-graphite cast iron will be visited, as well as other firms making alloy and special cast irons, and in all three countries lectures will be given to meetings of engineers, metallurgists and foundrymen. Mr. Braidwood will also take part in a conference of Australian s.-g. iron producers in Sydney. His return is scheduled for April 13. Mr. Braidwood's Paper, "Latest Developments in s.-g. Iron" (FOUNDRY TRADE JOURNAL, May 17, 1956), arranged to be given to the Lancashire branch and the Southampton section of the Institute of British Foundrymen on March 11 and March 20, respectively, will be presented, on the author's behalf, by his colleague, Mr. G. L. Harrison.

Dinner

SHEFFIELD BRANCH

The annual dinner of the IBF Sheffield branch, which was of record size, was held at the Royal Victoria Hotel; Mr. J. F. Stanier presided. Toasts and their replies were from Sir Archibald Forbes, G.B.E., The Master Cutler (Sir Peter Roberts, Bart., M.P.); Mr. G. L. Hancock (the senior vice-president); Sir Andrew McCance, D.L., D.SC., LL.D., F.R.S., and Mr. E. Julian Pode, J.P. At the high table were the chairmen and managing directors of the major local steelworks and foundries and the following representing trades and associations connected with the foundry industry:—Mr. H. J. V. Williams, president, Institute of British Foundrymen; Mr. P. J. Bovill, president, National Trades Technical Societies, and managing director, Newton Chambers & Company, Limited; Dr. H. H. Burton, C.B.E., president, the Iron and Steel Institute; Mr. L. K. Everitt, B.MET., president, Sheffield Society of Engineers and Metallurgists; Mr. V. C. Faulkner, F.R.S.A., Editor, FOUNDRY TRADE JOURNAL; Mr. Ambrose Firth, J.P., president, Sheffield and District Engineering Trades Employers' Association, and chairman, Brightside Engineering Holdings, Limited; Mr. W. T. Hobkirk, president, Association of Bronze and Brass Founders; Col. C. R. Hodgson, president, Sheffield Chamber of Commerce; Mr. P. Jubb, president, Sheffield Metallurgical Association; Mr. G. Lambert, secretary, Institute of British Foundrymen; Mr. S. Moffett, M.C., M.A., Director of Education, Sheffield; Mr. J. E. Stanier, O.B.E., G.M., and Canon E. R. Wickham, B.D., Industrial Commissioner in Sheffield. The faultless organization of the function was carried through by Mr. J. Pearce, the honorary secretary, and Mr. F. Cousans.

Company News

SMITH & WELLSTOOD, LIMITED—Interim dividend of 1¼ per cent., compared with 2½ per cent. previously.

SILENTBLOC, LIMITED—The directors have declared an interim dividend of 3d. per 2s. share, or 12½ per cent., in respect of the year ending May 31, 1957. This compares with an interim of 2½d. per share for 1955-56 when the year's payment was 6d. per share, or 25 per cent.

BROWN BAYLEY STEELS, LIMITED—The dividend for the year ended September 30, 1956, is being raised by 1 per cent. to 9 per cent. with a final payment of 6 per cent. (5 per cent.). Profits declined by £135,511 to £502,168. After deducting tax of £230,050 (£321,262) and crediting tax provision no longer required of £17,198 (£16,397), net profit was £289,316 (£332,814).

AUSTIN HOY & COMPANY (HOLDINGS), LIMITED, mining machinery manufacturers, of Saunderton, High Wycombe (Bucks)—Subject to CIC consent, it is proposed to make a scrip issue of one new ordinary 5s. share for every two held on February 21. It will require £62,500 of reserves. Group untaxed profits have expanded to £119,789 (£72,771). A final dividend of 15 per cent. on ordinary as increased by the one-for-four rights issue last July (against 17½ per cent. for 1955), is to be paid. The interim was 10 (7½) per cent.

J. SAMUEL WHITE & COMPANY, LIMITED, shipbuilders, etc., of Cowes (I. o. W.)—A final dividend of 10 per cent. is recommended, plus a bonus of 10 per cent. as forecast, which makes the equivalent of 22½ per cent. on the £560,000 ordinary capital—as doubled by a scrip issue—compared with the equivalent of 8¼ per cent. for 1954-55. Group trading profit has fallen from £442,297 to £412,624 for the year to September 30, 1956, but investment income is up from £2,989 to £11,998. To the 1954-55 balance, however, was added £54,197 applicable to earlier years. After tax of £205,583 (£268,222), etc., net profit is £153,656 (£163,420).

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED—With increased activity in every department the directors "have it very much in mind" that further cash for working capital will be necessary during the current year. The chairman, Capt. A. R. S. Nutting, states that the board wishes to be free to combine this with a capitalization of some of the reserves to bring issued capital more into line with the capital employed, and it is proposed to increase the authorized capital from £3,500,000 to £8,000,000. The total order-book is at a record level and ensures the necessity for full production for the current year and thereafter. The group's trading profit for 1955-56 was a record at £1,733,122 (£1,325,059).

LANCASHIRE STEEL CORPORATION, LIMITED—When negotiations are completed, the corporation may take a part in the reorganization and extension and also assume a financial interest in the Rhodesian iron and steel works at Redcliff (Southern Rhodesia). The new raw material handling plant and 600-ton mixer at the Irlam works had been brought into production and, since the end of the financial year, the first of two new large capacity blast furnaces and the first of the two new 250-ton steel furnaces had started production. Progress had been made on the building of the 21 new coke ovens, the provision of new sidings and other development to increase the works' capacity. Capital expenditure amounted to £2,917,742 (£2,401,175) and outstanding commitments to about £1,900,000 (£2,065,000). Net income of the group is £1,465,652 (£1,497,366) and the dividend is 11 per cent. (same).

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 5s.)

762,971. Mannesmann A.G., Mannesmannufer, 1b, Düsseldorf, Germany.

A process for increasing the casting output in continuous-casting installations of predetermined overall height, in which the molten metal is poured into vertical, fluid-cooled tubular mould liners open top and bottom, and having inner and outer surfaces. The area of contact between the metal and the inner surface of the mould liner is increased with respect to the area of contact of the cooling liquid with the outer surface of the mould liner. This is achieved by corrugating the inner surface to such an extent that the corrugations are filled with molten metal. Casting speed is thereby increased beyond the rate which can be obtained by normal continuous casting moulds of equal capacity and having smooth or uncorrugated inner surfaces.

762,994. A. Wimmer, 4, Burgweg, Hohenlimburg, Westfalen, Germany.

A method for the manufacture of steel and alloy-steels by means of the alumino-thermic process in which the alloy is obtained electrically from a starting material such as alumina, low-grade bauxite or low-grade ash-containing coal, containing aluminium oxide, silica, iron oxide and titanium oxide. The alloy is then admixed with iron-ore and subjected to an alumino thermic reaction.

763,036. Fritz Hansberg, 14, Via Ruggera, Modena, Italy.

A machine for the production of foundry cores and for filling moulding boxes with moulding sand by means of compressed air. The compressed air enters the storage container through an air-inlet valve and introduces the supply of sand into the core or moulding box to be filled. This air-inlet valve is constructed in the form of an annular slide valve surrounding the sand storage container. It is arranged parallel to the axis thereof, the annular slide valve working either in the manner of a rotary slide valve with rotary displacement or in the manner of a sleeve valve with axial displacement.

763,046. Foundry Equipment, Limited, and A. S. Beech, Linslade Works, Leighton Buzzard, Beds.

Apparatus for knocking out foundry moulding boxes, consisting of a massive base, and a relatively light-weight vibrating frame. A grille is mounted on the base, with resilient connection between the frame and the base. Rotary out-of-balance vibrators are spaced apart longitudinally on the frame and located at the front and each end of it. Upstanding rails are provided on the grille close enough to support the underside of the moulding boxes for knock-out purposes.

763,142. Philips Electrical Industries, Limited, Spencer House, South Place, Finsbury, London, E.C.2.

An anistropic permanent magnet manufactured from an iron-base alloy containing aluminium 5 to 11, nickel 10 to 22, cobalt 10 to 25, copper up to 7, either niobium or tantalum 0.2 to 7 per cent. (or a similar amount of a mixture of both these last two elements), and silicon 0.2 to 3 per cent. The aluminium content should be less than the silicon content and the silicon content should be greater than 0.6 less one fiftieth of the cobalt content.

A DOLLAR ORDER worth over £3,000,000 for the building of an oil tanker of about 40,000 tons has been secured from an American firm by the Atlantic Shipbuilding Company, Limited, Newport (Mon).

Raw Material Markets

Iron and Steel

It is expected that pig-iron output will continue to rise with the additional furnace capacity available during this year, the target being an output of 14,000,000 tons. Supplies of ore are maintained to provide adequate tonnages for the blast furnaces, apart from the hematite and low-phosphorus ores, the shortage of which is causing some concern. Ample supplies of blast-furnace coke are forthcoming. Of the increased quantities of pig-iron which are becoming available, the steelworks benefit mostly, as efforts continue to be concentrated on the supply of basic steel-making pig-iron, for which demands are very high. The position does not appear far distant when home supplies of pig-iron will be sufficient to meet the needs of all users, and so avoid the necessity of having to depend at all on imports.

Present production of the grades of foundry pig-iron are sufficient to satisfy all demands. The decreased supplies of the low-phosphorus and hematite irons for foundries supplying the motor vehicle trade have enabled larger tonnages to be sent to the busier engineering and speciality foundries, most of which are now able to obtain their full requirements.

Refined irons are easy and users are able to obtain prompt deliveries. In the high-phosphorus grade the supply is more in keeping with the present reduced demand. But there is little to spare and deliveries are delayed, as users have to depend, in the absence of stocks, entirely on outputs for the required qualities. The light-casting trade is not very busy, and textile foundries are also in need of more work, but the jobbing foundries maintain fairly good outputs. Generally, business at the foundries shows no signs of an appreciable early improvement. The increase in pig-iron prices will add to the cost of production and there is severe competition for the work now being placed on both home and export account.

Foundry coke deliveries are satisfactory, and the foundries appear to have sufficient scrap. Ganister, limestone, and firebricks are readily available. During the last few months, appreciable quantities of high-phosphorus and medium-phosphorus pig-iron have been sent abroad to avoid having to put the iron in stock. No licences to import have been necessary, but the Board of Trade, in conjunction with the British Iron and Steel Federation, has instituted licensing for pig-iron and most forms of steel. In the case of pig-iron, this is likely to have the effect of curtailing the export trade, but to what extent will not be known until the exact quantities scheduled for export are available.

The re-rollers maintain good outputs, and those producing small rounds for reinforced concrete are heavily committed. Order-books are favourable, with demands continuing at a steady rate from home consumers. The supply of steel semis is confined chiefly to home steelworks from which the recent improved deliveries are maintained. Only small consignments are received from abroad. For all re-rolled products export licences are now necessary. It is not possible to say whether this trade will be curtailed, but it looks as if the tonnages available for the first half of this year will be less than for the corresponding period of last year.

Non-ferrous Metals

Copper is a soft market on both sides of the Atlantic. In London on Monday the price dipped below £260 a ton for the first time since 1954. In the United States the custom smelters have lowered their price to 34¼ cents a pound, while the export price has come back to a weak 34 cents and No. 2 scrap to about 27 cents a pound. The major producers are still quoting 36 cents, but the fall in the custom smelter price and the fact that dealers are offering the metal at 34 cents foreshadows an early reduction. Paradoxically, the decline in the quotation may be indicative of a better demand, as there would be no sense in lowering the price unless it was felt that demand would expand more than proportionately.

In support of this contention it is possible to cite the case of the American brass mills, which have been experiencing a gradual expansion in orders, and if this movement it to gain momentum there is a great deal to be said for lowering the price at this time. Generally speaking, however, consumer buying is slight in both New York and in London, which market is still under the influence of the petrol shortage and the prospects of improved overall supplies.

One comforting item of news for the copper market was the announcement that Japan had decided to allow the importation of an additional 37,000 tons of copper. On the other hand, this will not make much impact on US stocks, which at the end of the year, totalled 120,635 tons, while those in the hands of fabricators amounted to as much as 437,187 tons.

Tin is quietly steady in London, where the backwardation has widened to £25 a ton, and in New York, where fear of a dock strike has induced caution resulting in demand for spot supplies. The strike continues at the Butterworth smelter in Malaya and this, together with alterations of shipping schedules in the East and an improved demand in London, has been responsible for the tight supply position and a widening of the backwardation.

Lead is quiet in London, but New York enjoyed a sudden sharp improvement in demand last week when the total absorption reached 11,222 tons, the highest figure since the end of November when battery manufacturers were making the most of the market. The London market is still influenced by the oil shortage and the Board of Trade announcement that it would sell 30,000 tons of the metal for delivery over the next nine months beginning next March. Of this total some 4,000 tons will be disposed of by open tender, while the balance will be offered back to the original suppliers. Nevertheless, prices are being well held as the US barter programme is beginning again and also the US Government has invited offers of domestically mined lead to be submitted by January 3 for delivery by March 15. The price is unchanged at 16 cents a pound.

The US barter programme also applies to zinc, as does the GSA offer to absorb the metal offered on January 3 for delivery by March 15. These factors dominate the market and have kept it firm despite an easier buying trend. Demand for zinc in the US is only fair and continues to be concentrated on "Prime Western" at 13½ cents per lb., East St. Louis.

Furniture Exhibition

It was noted at the furniture exhibition, held at Earls Court last week, that the modern trend of furniture design is precluding the use of cast accessories such as, handles, knobs, etc. Most manufacturers seem to be specifying plastic items instead; it is claimed that the result is a greatly expanded range of colours and lower cost. It is worthy of note that one company has started to supply filligree cupboard-handles and accessories manufactured from anodized die-cast aluminium alloy.

SHOT BLAST EQUIPMENT

by

BAKER PERKINS LTD

WESTWOOD WORKS · PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

January 30, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £51 15s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £75 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 14s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 17s. 7d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £96 0s. 0d. to £96 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. to 31s. 0d. per unit; over 6 per cent. C, £94 0s. 0d. to £95 10s. 0d., basis 60 per cent. Cr, scale 31s. 0d. per unit; 2 per cent. C,* 2s. 1½d. per lb. Cr; 1 per cent. C,* 2s. 2d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 6d. to 23s. 6d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £75 0s. 32d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d.; silico-manganese, £41 7s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent., C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £64 13s. 9d.; nickel-chrome, £88 15s. 3d.; nickel-chrome-molybdenum, £100 13s. 9d.

NON-FERROUS METALS

Copper.—Cash, £257 0s. 0d. to £257 10s. 0d.; three months, £256 0s. 0d. to £257 0s. 0d.; settlement, £257 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 6¾d. per lb.; rods, 297s. 9d. per cwt. basis; 20 s.w.g., 330s. 9d. per cwt.

Tin.—Cash, £796 0s. 0d. to £797 0s. 0d.; three months, £770 0s. 0d. to £771 0s. 0d.; settlement, £797 0s. 0d.

Lead (Refined Pig).—Second half January, £115 0s. 0d. to £115 10s. 0d.; second half April, £114 0s. 0d. to £114 5s. 0d.

Zinc.—Second half January, £104 15s. 0d. to £105 0s. 0d.; second half April, £100 15s. 0d. to £101 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £136 0s. 0d.; rolled zinc (boiler plates), all English destinations, £133 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £110.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 1¾d. per lb.; rods, drawn, 3s. 0¼d.; sheets to 10 w.g., 224s. 3d. per cwt.; wire, 2s. 9¾d.; rolled metal, 224s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £199; B6 (85/15), —; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £248; HTB2 (38 tons), —; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £271; LG3 (86/7/5/2), £282; G1 (88/10/2/½), £332; (88/10/2/1), £325.

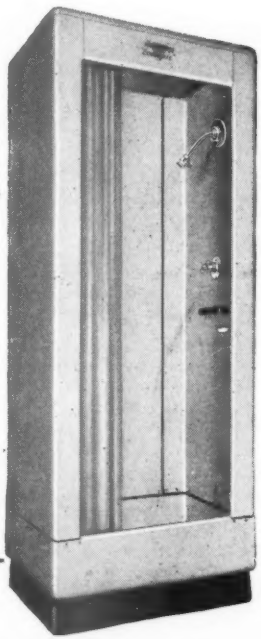
Phosphor Bronze.—BS1400, PB1 (AID released), — per ton.

Phosphor Bronze Strip, etc.—Strip, 318s. 6d. per cwt.; sheets to 10 w.g., 313s. 6d. per cwt.; wire, 4s. 2¼d. per lb.; rods, 3s. 6½d.; tubes, 3s. 4¾d.; chill cast bars: solids 3s. 6¼d., cored 3s. 7¼d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 4s. 0d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5¼d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £84 10s. 0d. to £84 15s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £285; AB2, —. Solder, brazing, BS1945, type 8 (50/50), 3s. 1d. per lb., type 9 (54/46), 3s. 4½d. per lb.

* Average 68-70 per cent.



still worrying about the Factory Act?

. . . . . no need to worry . . . . . just order "HOTSPRINGS ECONOMIC" SHOWER CABINET

Already in use in Foundries throughout the country

Carry it in —

Set it down —

Connect it up —

Self contained. Fits anywhere without structural alterations. Can be connected to existing services. Minimum water consumption and full temperature control with "Economic" Patent Sprayer and Mixing Valve.

CHARLES WINN & CO. LTD.

140, GRANVILLE STREET · BIRMINGHAM 1

PIG IRON

Low Phosphorus
Refined & Cylinder
Hematite
Malleable
Derbyshire
Northamptonshire
Swedish Charcoal

Ferro Silicon *(12-14%)*
Alloys & Briquettes
N.F. Metals & Alloys
Limestone
Ganister
Moulding Sand
Refractories

WILLIAM JACKS & Co., Ltd.

Winchester House, Old Broad Street
TELEPHONE: LONDON WALL 4774 *(8 Lines)* London, E.C.2.

Birmingham, 2.
39, Corporation Street.
MIDLAND 3375/6.

Liverpool, 2.
13, Rumford Street.
CENTRAL: 1558

Glasgow, C.2.
93, Hope Street.
CENTRAL: 9969.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

ASHTON-UNDER-LYNE, February 4—Castings, etc., for 12 months from April 1, for the Borough Council. The Borough Surveyor, Municipal Offices, Ashton-under-Lyne.

ATHERTON, February 16—Iron castings for the year ending March 31, 1958, for the Urban District Council. The Surveyor, Town Hall, Atherton, near Manchester.

BOLTON, February 8—Cast-iron gully grates and frames, gullies, manhole covers, and step irons, for 12 months from April 1, for the County Borough Council. The Borough Engineer and Surveyor, Town Hall, Bolton.

BROMLEY, February 1—Castings for the year ending March 31, 1958, for the Borough Council. Mr. Harold Cliffe, borough engineer, Municipal Offices, Bromley (Kent).

DEWSBURY, February 11—Iron castings, steel reinforcement, etc., for 12 months from April 1, for the Corporation. The Borough Engineer, Municipal Buildings, Halifax Road, Dewsbury (Yorks).

FREEBRIDGE LYNN, February 7—Providing and laying of approx. 4,140 yds. of 3-in. spun-iron pipes, etc., for the Rural District Council. Mr. W. R. Watkins, surveyor, 11, King Street, King's Lynn (Norfolk). (Deposit £2 2s.)

GREECE, February 5—Silica sand, for the Supreme Supply Committee, Ministry of National Defence (G.N.S.), Athens. (ESB/310/57.)

HALIFAX, February 9—Castings during the 12 months ending March 31, 1958, for the Corporation. The Borough Engineer, Crossley Street, Halifax.

HINDLEY, February 9—Tools, castings, etc., for the year ending March 31, 1958, for the Urban District Council. Mr. T. G. Grime, engineer and surveyor, Town Hall, Hindley (Lancs).

KING'S LYNN, February 9—Gully gratings, manhole covers, etc., for the 12 months ending March 31, 1957, for the Corporation. Mr. H. G. Ridler, borough engineer, Clifton House, 17, Queen Street, King's Lynn.

LONDON, S.E.17, February 6—Sewer cast ironwork; tools, iron, etc., for the Metropolitan Borough of Southwark. Mr. E. J. Pitt, town clerk, Southwark Town Hall, Walworth Road, London, S.E.17.

LONDON, E.C.1, February 7—Cast- and spun-iron straight pipes, cast-iron specials; mild-steel bars, plates, sheets, etc.; bolts and nuts, screws, files, shovels, etc.; lead pipe and solder; small iron castings, non-ferrous castings, etc.; firebricks, etc., for 12 months from April 1, for the Metropolitan Water Board. Mr. S. D. Askew, clerk of the board, Metropolitan Water Board, New River Head, Rosebery Avenue, London, E.C.1.

MORECAMBE AND HEYSHAM, February 22—Cast-iron pipes and special castings, for the Borough Council. The Borough Engineer, Town Hall, Morecambe and Heysham.

SALFORD, February 5—Iron castings, etc., for the City Council. The City Engineer, Town Hall, Salford (Lancs).

STAFFORD, February 8—Castings and road ironwork, etc., for the year ending March 31, 1958, for the Staffordshire County Council. Mr. F. Jepson, county surveyor, County Buildings, Stafford.

SLAITHWAITE, March 8—Cast-iron gullies, grates, and manhole covers during the 12 months from April 1, for the Urban District Council of Colne Valley. The Surveyor, Municipal Offices, Carr Lane, Slaithwaite, near Huddersfield.

STOKE-ON-TRENT, February 4—Cast-iron work, etc., for the 12 months ending March 31, 1958, for the Corporation. The City Surveyor, Town Hall, Stoke-on-Trent.

Changes of Name

Among the companies which have recently changed their names are those listed below. The new titles are given in parentheses.

ZINC ALLOY DIECASTINGS, LIMITED, Edward Road, New Barnet, Herts (British Pressure Diecastings, Limited).

MASSEY-HARRIS-FERGUSON (EXPORT), LIMITED, 35, Davies Street, London, W.1 (Massey-Harris-Ferguson Holdings, Limited).

M.H.F. (EXPORT), LIMITED, agricultural machinery manufacturers, etc., of Fletchamstead, Highway, Coventry (Massey-Harris-Ferguson (Export), Limited).

Forthcoming Events

FEBRUARY 4

Institute of British Foundrymen

Sheffield and district branch:—"Some Aspects of the CO_2 Process," by I. Reese and D. H. Snelson, 7 p.m., at the Sheffield College of Commerce & Technology, Department of Engineering, Pond Street.

FEBRUARY 5

Institution of Production Engineers

Halifax section:—"Training of Production Managers and Engineers," by G. S. Bosworth, M.A., 7.15 p.m., at the George Hotel, Huddersfield.

Incorporated Plant Engineers

London branch:—"Automation—the Maintenance Aspect," by Sir Walter Puckey, 7 p.m., at the Royal Society of Arts, John Adam Street, Adelphi, Strand, W.C.2.

Institute of Industrial Supervisors

Swindon sub-section:—"How the Metallurgist Aids Production," by K. W. Loveday, B.SC., 7.30 p.m., at the College, Victoria Road.

Rotherham section:—"Operational Research," by R. H. Collcutt, B.SC., 7.30 p.m., at the Grand Hotel, Sheffield.

FEBRUARY 6

Institute of Industrial Supervisors

Bradford/Dewsbury section:—"Cost Factors the Foreman can Control," by Mr. Feugill, 7.30 p.m., at the Technical College, Bradford.

Combustion Engineering Association

"Smokeless Operation of Boilers and Furnaces on Solid Fuel," by C. H. G. Hayward, 10.30 a.m.; at 2.30 p.m., "Smokeless Operation of Boilers and Furnaces on Liquid Fuel," by C. A. Roast, at the Leofric Hotel, Coventry.

Institution of Works Managers

Paisley group:—"Computer Control of Machine Tools" and "General Principles of Electronic Systems," by G. S. Kermack, 7.15 p.m., Thomas White & Sons, Limited, Laigh Park.

FEBRUARY 7

Incorporated Plant Engineers

Peterborough branch:—"Light and Lighting," by A. L. Berridge, 7.30 p.m., at the White Lion Hotel, Church Street.

Institute of British Foundrymen

Stoke-on-Trent section:—"Grey-iron Casting for the Woodworking Machinery Industry," by R. Higgins, 7.30 p.m., in the Court Room, Hanley.

Institute of Metals

London local section:—"Beryllium," by Bengt Kjellgren, 6.30 p.m., at 17, Belgrave Square, London, S.W.1.

FEBRUARY 8

Institute of British Foundrymen

Tees-side branch:—"Ultra-light Castings for the Motor-car Industry," 7.30 p.m., at the Teesdale Hall, Head Wrightson & Company, Limited, Thornaby-on-Tees.

Institute of Industrial Supervisors

North-Western section:—"Incentives for Supervisors," by J. Hudson, 7.30 p.m., at Houldsworth Hall.

FEBRUARY 9

Institute of British Foundrymen

Lancashire branch:—"Casting of Magnesium Alloys," by P. A. Fisher, 3 p.m., at the Midland Hotel, Manchester.

Newcastle and district branch:—"Fettling of Steel Castings," by H. Herdman, 6 p.m., at the Neville Hall, Westgate Road, Newcastle-upon-Tyne.

Scottish branch:—"Metallurgical Factors Affecting Locomotive Castings," by W. Montgomery, 3 p.m., at the Royal Technical College, George Street, Glasgow.

FEBRUARY 19 to 21

Institution of Mechanical Engineers

Conference:—"The Mechanical Engineer's Contribution to Clean Air," at the Central Hall, Westminster, S.W.1. (Prior registration required.)